Telephony

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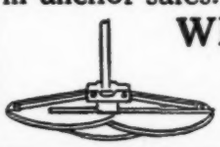

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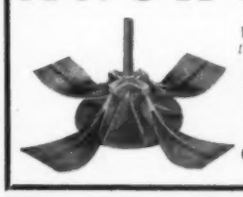

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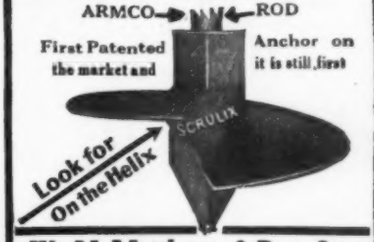

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Telephony.

THE AMERICAN TELEPHONE JOURNAL

Comprising Telephony, American Telephone Journal, Telephone Weekly, Telephone Magazine, Telephone Securities, The Telephone, Sound Waves.

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CHICAGO, SATURDAY, AUGUST 9, 1919

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Defects of Federal Ownership.

In a recent editorial relative to the telephone service in Great Britain, The Electrical Review, London, discusses underlying faults of government ownership. It says:

"London will continue to suffer from the vagaries of the service, which is being held up as a terrible warning of what may be expected from nationalization in other directions. We have a clear conscience, remembering that we uttered that warning time and again when the transfer of the National Telephone Co.'s system to the state was under consideration; but we would far rather have seen our gloomy predictions falsified than verified as they have been.

"One of the fundamental defects of the state system of control is the inevitable development of mediocrity; the state, apparently, dare not pay the price for the best men. The highest salary in the Post Office engineering department, we believe, does not exceed £1,200 a year, a ridiculous remuneration for so onerous a post, which should be occupied by the most energetic, progressive, and up-to-date engineer that could be found, at a corresponding salary, and with freedom to select his assistants to suit his needs.

"A system which depends upon promotion by seniority can never be anything but mediocre and inefficient."

That also was the opinion recently expressed in TELEPHONY's office by an American who for years has been engaged in telephone manufacturing in England. He has had excellent opportunity to observe Great Britain's telephone service, both under private ownership of the systems and later under government ownership.

This country was especially fortunate that government control and operation rather than government ownership and operation were first attempted. Those connected with the government learned many practical facts about the telephone industry which did not at all fit in with the theories they believed should be applied.

There always has been a difference between theory and practice. This was soon discovered to be more than true of the telephone industry by the government officials when they began a year ago to place into practice their various theories. Fortunately practical telephone men were able to convincingly demonstrate the impracticability of most of the theoretical schemes before they were ordered tried.

It was a great experience, and we—the industry, the government, and the public—are all much wiser than before the experiment commenced. The cause of government ownership has lost a good many of its advocates—and the industry is safe from the faults incurred through development of mediocrity. Private initiative will still continue and America's telephone service, as it always has, will be the world's standard.

The Telephone Servant.

The telephone certainly is an invaluable servant to man in this age of the world. Too often we are so familiar with it that we fail to appreciate how indispensable it has become. A government official report on the telegraph systems was issued at Washington the other day, and buried in its mass of statistics were a few paragraphs on train-dispatching by telephone. One of them read:

"The total line mileage of railroads reporting the use of telephones for transmitting train orders in 1917 amounted to 110,404. It is asserted *that not a single accident has resulted from the use of telephones in train-dispatching.*"

Could a greater tribute be paid to the value of telephone than that sentence, to which we have added the italics? As a sales argument that single assertion would carry conviction in any case. Since 1912 the use of the telephone in railroad work has increased over 67 per cent. On January 1 of this year there were 113,440 miles of road operated by telephone, or 46.4 per cent of the total mileage. Now that the war is over this percentage undoubtedly will soon greatly increase.

With the freedom from disastrous errors noted in the foregoing quotation, one would naturally conclude that the railways would soon depend altogether on the telephone for train-dispatching. If real service determines the value of an invention—as it should—the telephone ranks close to the top of the list.

Burleson Returns All Wire Systems

Final Order Restoring Properties Issued on July 30—Postmaster General Rests Calmly on Record—Rate Increases Are Defended—Systems Administered by Him with "Justice and Fairness to the Employes and Owners"

The final order terminating the period of government control of the wire systems of the country was issued by Postmaster General Burleson on July 30. It called for the return to their respective owners at midnight, July 31, of all telegraph and telephone systems which have been under government control.

Under the order, which he asserted by direction of President Wilson, in accordance with the legislation of Congress which the President approved on July 11, the Postmaster General's supervision, control, and operation of the wire systems concludes at that time.

The text of the order for the return of the wires is given in full on this page.

In thus bringing to an end the first attempt at government control of the wire systems Mr. Burleson also issued a statement in which he asserted that he is ready to abide by the result of the determination "by sound public opinion" as to "how this trust has been met."

"With the issuance of order No. 3,380, providing for the auditing and accounting division," said Mr. Burleson, "the first government control of the wire systems of America is brought to an end. Sound public opinion will ultimately determine how this trust has been met, and the Postmaster General is content to abide by the result.

"During government control just increase of wages for operatives has been made in all cases where they were deserved and where the revenues of the companies permitted them to be made.

It is a source of gratification that the United States Independent Telephone Association on June 26 and July 22, 1919, unanimously endorsed the government's control as 'wise, just, and impartial,' and the greatest living wire expert in a report, July 15, 1919, to the stockholders of his company, representing nearly 80 per cent of the telephone service of our country, said:

'There has been no policy adopted by the Postmaster General during the period of federal control which was not in the interest of the service and with which your organization has not been in full accord. This co-operation has resulted in the maintenance of the service at the highest standard possible under the extremely arduous conditions. It is gratifying now to state that your property has been maintained and will be returned in as good condition as though it had never been out of your possession.'

Increases of telegraph and telephone rates have been made during government control, but the percentage of such increase was markedly less than the average of increases of rates made during this same period for other public utility services, and, but for court injunctions in 18 states, instigated by state utility commissions, the wire systems would have been returned to their owners without any obligations on the Federal Treasury because of compensation contracts.

The Postmaster General desires to express to the officers of the various telegraph and telephone companies his grateful appreciation of the uniform co-operation given during the period of government control. It is a source of gratification and pride to him that, with one notable exception, the reason for which is thoroughly understood by those who have kept informed, every wire company has given him loyal co-operation during the period of stress through which he controlled the wire systems of our country.

This co-operation has resulted in the work of the Postmaster General being made quite easy, and has enabled him to derive an amount of genuine pleasure and enjoyment from the task that was imposed upon him which was not in the slightest marred save by the controversy

POST OFFICE DEPARTMENT.

Washington, July 30, 1919.

Order No. 3380: In accordance with the Act of Congress, approved July 11, 1919, and by direction of the President, all of the telegraph and telephone systems, lines, and properties, including all equipment thereof and appurtenances thereto whatsoever, and all materials and supplies, taken possession of or received, operated, supervised, or controlled, by the Postmaster General under and by virtue of the joint resolution of Congress approved July 16, 1918, and the proclamation of the President, July 22, 1918, are hereby ordered to be returned and delivered to the respective owners thereof at midnight on July 31, 1919, and the supervision, possession, control and operation exercised by the Postmaster General under and by virtue of said joint resolution and proclamation of the President, will cease and terminate at that date and hour.

All such telegraph and telephone companies are hereby directed to close their books as of midnight July 31, 1919, and to proceed promptly to collect all outstanding indebtedness and accounts arising out of the operation of such systems during the period of Government control, and at the earliest practicable time to submit a full account to William H. Lamar, chairman of the finance committee, Wire Control Board.

Each company with which a compensation agreement has been entered into or to which compensation has been awarded, will, if its accounts show an excess over and above the compensation allowed, transmit such excess, together with a statement of account, within five days after the ascertainment of the amount due, to said William H. Lamar, chairman of the finance committee, Wire Control Board, in the form of a certified check or bank draft, payable to A. S. Burleson, postmaster general.

All books and accounts kept during the period of government control shall be preserved by the respective companies and shall continue under the control and supervision of said William H. Lamar, chairman of the finance committee, Wire Control Board, and shall at all times be subject to examination by the auditors and accountants of the control board.

All companies under control of the government with which compensation has not been fixed or concluded by agreement or by operation of orders Nos. 2980 and 2175 should at once take up with said William H. Lamar, chairman of the finance committee, Wire Control Board, the matter of the fixing of such compensation, so that the Postmaster General may make his report to Congress upon the operation of the various wire systems on or before November 1, 1919, as required by law.

A. S. Burleson, Postmaster General.

with one company previously referred to.

The labors of the Postmaster General are brought to an end with a consciousness on his part of having at all times administered these wire systems with justice and fairness to the employes and the owners of these properties, and in such way as to render the best service possible to the general public under abnormal conditions.

The Postmaster General will be ready to report to Congress on November 1 next as required by law."

Rates of July, 1918, Ordered Restored in Wisconsin.

The Wisconsin Railroad Commission, on August 4, issued an order to all telephone companies, effective August 1, when the companies went back to private control, restoring the rates in effect July 31, 1918, when the government took over the wires. No changes in the restored rate will be made by the commission unless telephone companies apply in the usual manner.

This order applies to all telephone companies of Wisconsin which did not sign compensation contracts with the federal government, or which did not file claim with the Postmaster General before June 20, 1919, for compensation, other than net earnings since July 31, 1918.

The Wisconsin Telephone Co., which controls the great toll lines of the state, has a compensation contract and the toll rates will, therefore, remain unchanged for four months longer under the act of Congress terminating the control.

Until the expiration of the four months, these rates will continue to be those fixed by Postmaster General Burleson when the federal government took control. The Independent telephone companies, August 1, reverted to the rates which were in effect before government supervision. On this point, the notice of the commission announces that "service connection charges" and "charges for moves and changes" are null and void and the companies are ordered to discontinue their collection.

Indiana Commission to Review Rates Fixed by Burleson.

The policy of the Indiana Public Service Commission relative to the increased telephone rate established by Postmaster General Burleson during the period of federal control is explained in the following statement:

"The act returning the whole system to private control and operation which took effect at midnight, Thursday, includes the telephone as well as the telegraph companies. In returning the wire systems, Congress did not provide for an extension of present telegraph rates beyond Thursday midnight, but did provide that the existing toll and exchange telephone rates shall continue in force for a period not to exceed four months. After this it takes effect unless further modified or changed by the public authorities—state, municipal or otherwise—having control or jurisdiction of the tolls, charges and rates or by contract or by voluntary reduction.

"Upon proper petition or upon its own initiative, the Indiana Public Service Commission will review all telephone rates established during the period of Federal control within the next four months, but in each instance only after notice which will enable all having interest to be heard."

Illinois Commission Issues Emergency Orders in Chicago Case.

The Illinois Public Utilities Commission decided July 31 that the Burleson telephone rates of the Chicago Telephone Co., in Chicago, are to continue in effect until a public hearing is held on the application of the company to continue the war-time rates after August 1. The commission's order will remain in effect until November 30. Meanwhile the commission will pass finally upon the company's application for permission to charge the Burleson rates indefinitely. The hearing was set for September 12.

A few modifications of the Burleson rates are made in the decision of the commission. The chief modification was the restoration of the four-party line "nickel-a-day" residence telephone. Persons using this service will pay $1.50 for 30 messages a month instead of the new rate of $2 for 40 messages a month, as laid down by Postmaster Burleson's regulations. Excess messages are to be charged for at the rate of 4 cents each.

All telephone moving and installation charges are abolished.

The modifications, which are mainly for the benefit of the subscriber, also abolish all additional and excess charges for person-to-person calls and appointment calls, such service to be furnished upon request at the same rates prescribed by the Postmaster General for station-to-station service. This applies to cases where messages originate and are received within the state.

The company also is required to establish and maintain a fund containing one-eighth of all receipts from Chicago telephones and 25 per cent of the receipts of long distance calls from Chicago to other Illinois points, the fund to be under the control of the utilities commission and to be used as a "refund" fund for subscribers in case the rates are further modified.

The company is ordered so to keep its books and accounts as to show the operating income from the various kinds and classes of service performed, so that the amounts which are to be refunded, in case the commission shall order reparation, may be readily determined. The telephone company, if it accepts the order, in so doing agrees not to appeal from the order by suit at law or in equity, "or otherwise prevent, hinder or delay any reparation or repayment when, as, and if the same may be ordered by this commission." The waiver, however, does not bind the company beyond the four months' period.

In its decision the utilities commission takes cognizance of the application of the company which was filed on July 18 and its statements that it had been notified by the city of Chicago that the latter expected to proceed on August 12 with the regulation of rates for telephone service, and of the company's assertion that it is paying out $1,800,000 more annually for wages than when the war began.

The purpose of the temporary order is contained in the statement that "on and after August 1, 1919, a situation exists which makes it proper for the commission to enter a temporary order insuring as far as possible the maintenance of the service rendered by the companies, without disturbance or interruption, and to protect the public as to rates pending the final determination by the commission of the just and reasonable rates to be charged by the applicant for its service."

That a possible revision of rates downward is contemplated by the commission is indicated in the creation of the fund for repayment to subscribers in case further modifications in rates are made; and in a statement in the commission's decision that "there is not sufficient evidence in the record to justify the approval by the commission of the proposed schedules filed by the aplicant."

Rate Hearings in Minnesota to Begin Late in Fall.

The Minnesota Railroad & Warehouse Commission will begin public hearings late in the fall on applications by the Northwestern, Tri-State and other telephone companies operating in Minnesota for authority to continue in effect after December 1 the higher rates inaugurated under wartime emergency orders of the federal director of telephone and telegraph lines.

Commissioner Fred W. Putnam, in charge of telephone matters in the state board, indicated this following a recent informal conference with W. B. T. Belt, president, and Guy H. Pratt, vice-president of the Northwestern Telephone Exchange Co. "Although no definite understanding was talked today," he said, "it is expected that the applications will be filed when valuations of all Minnesota properties are completed by the companies and the state has checked them and finished its appraisal of toll lines. Then hearings will start probably late this fall or early in the winter."

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Quiz Questions on the Preceding Installment.

1213. What feature of mechanical switching offers an advantage that is usually much less apparent in manually-operated equipment? Is this advantage confined to the type of mechanical switching equipment that has been described or is it found in other types of commercial mechanical switching systems?

1214. In a four-digit mechanical switching system of the sort shown in Fig. 298, which switch is operated by the first series of impulses passed by the calling device of the calling station.? What is the difference between the wiring and equipment of the first selector and that of the second selector in such a system? Where do the impulses originate which drive the first and second selector wipers in the rotary motion?

1215. In the example given, as to the division of traffic, compare the distributing function of the first selector bank levels and that of separate strips of outgoing multiple trunk jacks in the manual switchboard. How are the selections made for branch offices in the automatic multi-office system using equipment such as has been described?

1216. Can group selections in a multi-office automatic system be made elsewhere than in the banks of the first selectors?

1217. How is the current supplied to the calling station transmitter when the connector involved is located in a distant office and the intervening trunk circuits are very long? Are trunk circuits between first selector banks and second selectors in the single office system two or three-wire trunks?

1218. What are the operating functions of the automatic trunk "repeater"?

[Author's Note: The second word in the eighth line of the second paragraph in section 1213 should be "centers" instead of "circuits" as printed. With this correction the sentence reads: "In such cases the centers having a pronounced community of interest are each served from one of several central offices and the several central offices are interconnected by means of inter-office trunks.]

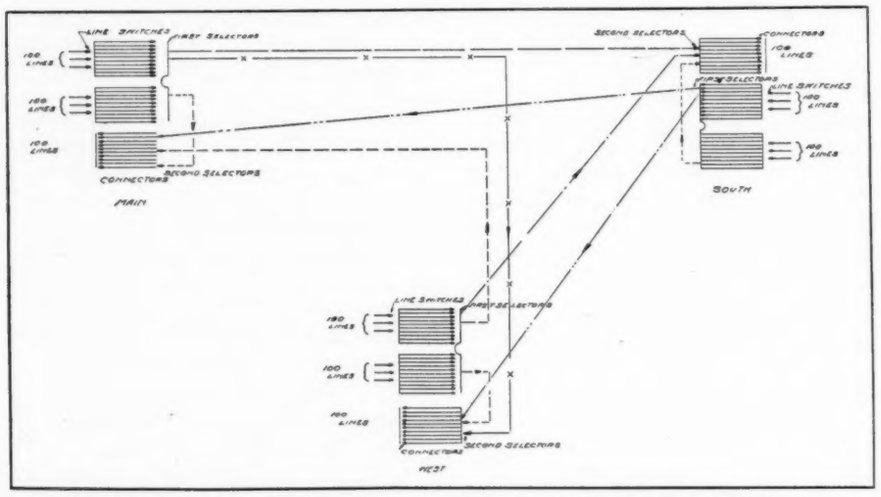


Fig. 299. Traffic Distribution in Four-Digit, Three-Office Automatic Exchange.

CHAPTER XXXII. Mechanical Switching. (Continued.)

1219. *Traffic distribution.*—The general scheme of traffic distribution by means of which calls in the multi-office system may be switched in exactly the same way, whether destined for a line terminating in the originating office or one terminating in another office, is shown in Fig. 299.

This diagram represents three imaginary offices, called for clearness Main, South and West. Two groups of 100 lines each are schematically represented in each office, each group having access to ten first selector equipments. The groups of first selector equipments have access, in turn, to groups of ten second selectors, in each office.

In other words, the group of first selector switches to which one group of 100 line circuits have access, in the Main office, has access, through the various levels of its banks to some second selectors in all offices. The second selectors, in any office, have access to all the connector switches in the same office. This means that the office in which the called line circuit is located is selected by a first selector in the office in which the calling line is terminated.

1220. *Route of inter-office call.*—This will be more clearly seen if a concrete case is taken and the progress of the call traced from the calling to the called telephone. Suppose, referring to Fig. 299, that a subscriber served by a line terminated in the Main exchange calls a subscriber served by a circuit terminating in the West exchange. The line switch associated with the calling line will be first operated and will connect the calling line with a trunk circuit leading to a first selector in the Main office. Up to this point only switching equipment has been operated in the originating office.

When the calling subscriber releases the sending device on his telephone in sending the second digit, the wiper shaft of the seized first selector is raised to the level in which bank contacts are found leading to the trunk circuits affording the only avenue of access to the group of lines in which the called line occurs. It is by this selection that the traffic is classified as to its final destination.

The call may be destined for a line in the Main office. In that case its course will be that indicated by the broken line from the Main first selector banks to the Main second selector switches. If it is a call to reach a telephone served by a circuit terminating in the South office, its course will be that shown by the broken line having long dashes.

Should the call be intended for a telephone served by a line terminating in the West office, its course will be that shown by the X and dash line. It is obvious that the first selector will determine, by the position of its wipers when the first series of impulses has been sent, where the next switch that is to be operated is located.

If the call is intended to reach a telephone served by a line circuit terminated in the Main office, the first selector wipers will advance into the selected row until

they find an idle trunk circuit to a second selector switch. The trunk over which the call will be built up from the first selector to the second will be a three-wire trunk consisting of two talking circuit wires and a release trunk. Such a circuit is shown in Fig. 298 as extending from the first selector banks to the second selector switch. Should the call be destined for a line in one of the branch offices, it would be carried to a trunk repeater over a three-wire circuit and from the repeater to the branch office, over a two-wire circuit.

In either case, the second release of the sending device at the calling station will result in raising the second selector switch wiper shaft to the level, in its banks, which will lead to the group of connector switches affording the only avenue of access to the called line circuit.

When the second selector switch wiper shaft has been raised to the level in its bank in which the trunk leading to the

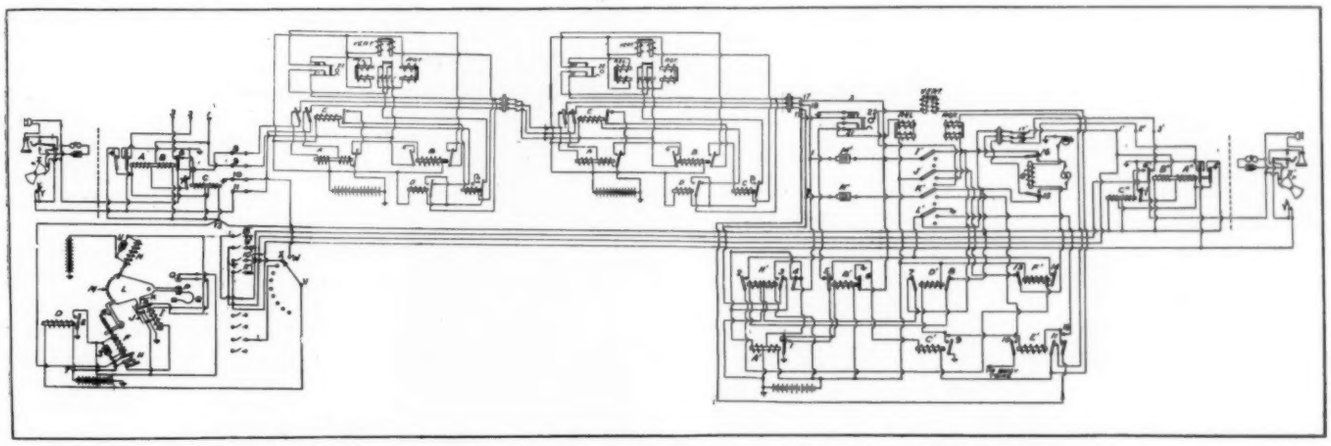


Fig. 298. Circuit of Completed Connection in Single-Office Four-Digit System.

desired group of connector switches terminates, it selects an idle or disengaged connector switch. This operation is precisely the same in every particular as the selection of a disengaged second selector by the first selector wipers.

The third and fourth series of impulses from the sending device of the calling telephone drive the selected connector switch in the vertical and rotary direction to the bank contacts of the called line circuit.

1221. *The secondary line switch.*—The trunking scheme illustrated in Fig. 299 is very flexible and by means of the slip in cabling, the trunks will each be given approximately the same amount of traffic to handle. In order to still further increase the flexibility of the system, however, the secondary line switch is sometimes introduced.

It will be remenmbered that the ordinary line switch pre-selects a disengaged trunk leading to the other switching equipment so that any calling line is at once connected to a disengaged connector, or first selector, as the case may be.

In order to arrive at a clear understanding of the underlying principle of the secondary line switch, suppose that the number of trunks required to handle the traffic from the Main exchange, Fig. 299, to the South exchange is 50 and that the traffic has already reached a point at which additional trunk capacity must be provided. Now 50 trunks will also occupy five levels in the first selector banks at the other offices, there being ten sets of bank contacts in each row.

When there are ten calls in any one of the bank levels, therefore, it is impossible that another call can be sent into the same level since no non-busy bank contacts will be found.

It will be remembered that the line switch is the connecting link between the line circuits and the first selector trunks or, if the system be a small one requiring only two digits in each number, to the connectors. Its installation renders available, to the calling circuit, an idle trunk circuit without the necessity of providing for a switch, such as a first selector *for each line.*

If it were not for the possibility of making this selection between the calling line and the trunk to be used in building up the connection, it would be necessary to provide one selector for each line circuit and this is precisely what was done in early automatic exchange equipments.

It is just as logical to place such a selection between the line switch banks and the first selector switches, and this is the location of the secondary line switches. They are almost exactly like the line switches and operate in the same way with the exception that they are actuated when a call is placed upon the trunk circuit leading to the first selector, and they distribute the calls from the line switches to a much larger group of trunk circuits than would otherwise be possible.

(To be continued.)

New York Telephone Co. Has Big Construction Program.

Announcement was made by Vice-President F. H. Bethel, of the New York Telephone Co., recently that $26,000,000 is to be spent to put the service in New York city and the metropolitan district back to the level of efficiency maintained before the war.

The outlay will be divided about as follows: $1,250,000 for new toll boards, $50,000 to complete additions to central office equipment, $3,250,000 for new buildings and additions to existing ones, $12,000,000 for new central office installations and additions to existing ones, and $9,300,000 for station equipment and extensions to outside plants.

Part of the work on the $3,250,000 for new buildings has already been started.

Convention of Missouri Association in September.

The Missouri Telephone Association will hold a two-day convention in the House of Representatives, Jefferson City, Mo., September 16 and 17. Among the subjects to be discussed are: "The Service Connection and Removal Charge," "The Present Standardized Toll Rates," "A System of Bookkeeping and Accounting," "The Necessity of Increased Revenue of Many Companies to Meet High Operating Cost."

The executive committee is at work on the program and as soon as complete arrangements for the speakers have been made, it will be announced.

Indiana September Convention Dates Announced.

Announcement has just been made that the Indiana Independent Telephone Association will hold its next annual convention at Indianapolis, Ind., on Tuesday, Wednesday and Thursday, September 16, 17 and 18.

Underground Cable Being Installed in Rocky Mount.

The Franklin Telephone Co. is installing underground cable in Rocky Mount, Va., upon the completion of which it will have practically an all-cable system in that city.

Wooster, Ohio, Has New Exchange

New Central Office Equipment Installed in Modern Exchange Building by Millersburg, Wooster & Orrville Telephone Co.—History of Company's Growth from System of 300 Telephones in 1908 to 6,500 at the Present Time

By George R. Eaton

When the new central office building of the Millersburg, Wooster & Orrville Telephone Co., at Wooster, Ohio, was recently placed in service, officials of the company for the first time in years permitted themselves sufficient time away from business to admire the modern structure at leisure and to congratulate themselves that they are connected with such an enterprising and progressive group of telephone men as make up their official family.

Both in general layout and utility, the new building ranks well with those owned by other live-wire Ohio companies, and Wooster subscribers have every reason to believe that their home company is going the limit in order to furnish them with the best possible service, as well as to make their offices representative of the community.

This company has had an interesting and varied history. It was originally organized in 1899 at Millersburg, and came into its present form in 1908 when Dwight E. Sapp and Frank L. Beam, of Mt. Vernon, purchased the plant from its former owners and organized a new company with George Adams, of the Adams Bank of Millersburg, as its first president.

C. M. Lovett, of Wooster, is now president. Frank L. Beam, of Mt. Vernon, is vice-president, having held that office since the first organization of the company. M. M. Herron, of Millersburg, has been treasurer and financial adviser for the past nine years. Miss Laura Heinig for the past 19 years has been bookkeeper and has general supervision over the business affairs.

Directors of the company are: Otto Troutman, of Shreve; D. F. Griffeth, of Orrville; T. E. Steiner, of Wooster; and A. N. Brenneman, of Orrville. There are 332 stockholders, mostly residents of Holmes and Wayne counties.

Marion L. Davis, manager of the Orrville exchange, wire chief of Wooster and inspector of switchboards over the entire system, has been in the employ of the company for 13 years, with headquarters at Orrville.

Five Operators Are Required to Handle the Toll Traffic in and Out of the Wooster Exchange.

The success of the company is largely due to the untiring efforts and devotion of M. M. Herron, its efficient secretary and general manager, with headquarters at Millersburg, Ohio.

Years before the reorganization of the Millersburg, Wooster & Orrville Telephone Co., the Bell company had invaded the field at Wooster with an exchange which was afterward withdrawn because of insufficient patronage.

Commencing at the time of its reorganization with approximately 300 telephones in service, the company has steadily increased its business until it now serves 6,500 stations located throughout its territory, and operates 17 exchanges. The principal exchanges are located at Wooster, Millersburg, Apple Creek, Big Prairie, Fredericksburg, Holmesville, Marshallville, Nashville, Orrville, Rittman, Shreve and Smithville.

The new fireproof building of the company at Wooster is arranged with a view to serving the convenience of the public and at the same time making working conditions as pleasant as possible for operators and other employes. The operating rooms are light, comfortable and airy, and the general offices, operators' restrooms, storerooms, and other quarters, are well adapted for the transaction and handling of the business. The warehouse, stockrooms and garage are in a separate building connected by bridge at second floor.

The switchboards and supplementary equipment were manufactured by the Kellogg Switchboard & Supply Co. and are of the latest and most approved design.

The New Operating Room at Wooster, Ohio, Is Well Lighted and Ventilated.

The exchange equipment consists of a common battery multiple switchboard, wire chief's desk, chief operator's desk, complete terminal and power equipment. In the design of this equipment, every effort was made, first, to provide the highest class of telephone service from the subscriber's stand-

Miss Laura Heinig Is Bookkeeper and Has General Supervision Over the Company's Business Affairs.

C. M. Lovett, President of the Company, Is a Banker at Wooster.

Marion L. Davis, Local Manager of the Orrville Exchange, Has Been With the Company 13 Years.

point, and, second, an equipment that could be operated efficiently and economically by the telephone company.

The local board equipment consists of four sections of 8-panel 3-position switchboard. The section has an ultimate capacity of 3,600 lines with 1,600 equipped. Position No. 1 is equipped as a toll-switching position; positions Nos. 2 and 3 are equipped as rural positions; and positions Nos. 4 to 6, inclusive, are equipped as subscribers' common battery positions. Position No. 7 is arranged as a service position.

The toll-switching position is equipped with trunks of the latest type. Positions Nos. 2 and 3 are supplied with universal cord circuits so arranged that when used in connection with a local or a common battery line, they will give as near as possible the same type of service as furnished on the regular common battery cord circuit.

The features furnished on the universal cord circuit are machine ringing, trip during the ringing and the silent period, and flash recall; these features operating in connection with a common battery line circuit.

The subscriber or common battery positions are equipped with cord circuits having these features: Five-frequency machine ringing, trip during the ringing and the silent period, keyless listening, flash recall with recall seizure key, register peg count on the

M. M. Herron, Secretary and General Manager.

H. W. Cary, Treasurer and Financial Adviser.

Frank L. Beam, of Mt. Vernon, Is Vice-President.

Capable and Experienced Telephone Men Are in Charge of the Company's Operations.

T. E. Steiner.

D. F. Griffeth.

A. N. Brenneman.

Otto Troutman.

The Directors of the Millersburg, Wooster & Orrville Telephone Co. Are Substantial and Prominent Business Men of the Communities in Which the Company Operates, Two of Them, Messrs. Griffeth and Troutman, Being Bankers.

answering cord, and revertive ringing tone.

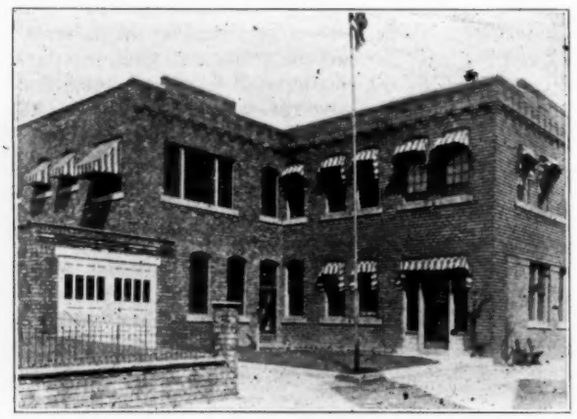
Pilot circuits are provided so that the chief operator may check the operator at all times; these pilots consist of an answering supervisory pilot, a calling supervisory pilot, a flash supervisory pilot, and a listening pilot.

A multiple line-lamp circuit is furnished, providing a means for securing to the subscriber rapid answering of all calls.

Line pilot circuits are provided on each panel, operating in connection with the multiple line lamp-line circuit.

One hundred combined drops and jacks are furnished for use with the rural lines. Local-to-rural trunks are provided for handling local-to-rural calls. These are plug-ended in the common battery or local positions and jack-ended in the rural positions.

A howler circuit is furnished in this position, arranged to provide a gradually increasing tone so as to secure the replacement of receivers accidentally left off the switch-hook.



The New Wooster Exchange Building Is of the "L"-Shaped Design With Garage.

The toll board consists of six positions and 100 toll line circuits are furnished. These are of the lamp signal type, arranged with answering and multiple jacks, busy lamps being associated with all the latter jacks.

The toll cord circuits are of the high efficiency type equipped with a combined ringing and ring-back key, a double cut-off key, and a listening key. They are arranged to complete toll-to-toll and toll-to-trunk connections. Ten cord circuits are equipped in each position.

The recording trunk circuits are of the multiple line-lamp type, arranged so that any operator may answer the recording trunks.

The chief operator's desk of the two-position type, is arranged to provide complete chief operator and information operator service. Complete circuit equipment is furnished so as to provide in and out trunking facilities, service-observing, and a complete monitoring equipment for checking the operators.

The wire chief's desk is provided with all the necessary in and out trunks, testing equipment, and testing trunks to the local switchboard, the toll switchboard and the racks in the distributing room.

The Operators Are Delighted With Their New Rest Room and the Adjoining Kitchenette.

The common battery testing trunks are of the combined testing and hospital type, arranged to provide an out-of-order tone so that the operators in testing will not report the line busy but report it out of order. A howler circuit of the same general type as furnished on the local board is furnished in connection with the testing circuit.

The terminal room equipment consists of the latest type of relay rack and main distributing frame, with complete protection for all incoming lines. The cord and trunk relays are mounted in the terminal room and cabled to the subscriber positions.

The power equipment consists of a fuse panel, a power board with the necessary rectifiers, five-frequency pole changers, transformers, storage batteries, etc. All power equipment except the storage batteries is installed in the terminal room, so arranged as to be under the direct supervision of the wire chief. The storage batteries are located in a special battery room in the basement.

This brief outline of the exchange equipment shows that the telephone company has made every effort to provide an exchange equipment that should care for the present and the future growth of Wooster for many years to come. In providing as complete an equipment as this, it has also provided a building of a type and character that would be expected from a progressive telephone company.

The building is fireproof, as previously mentioned. The telephone equipment is all located on one floor, and in the layout and design of this floor plan, every effort was made to provide space for future growth and to furnish congenial operating conditions for those in the employ of the company.

The company is capitalized at $500,000, all common stock, there being no preferred stock, nor any mortgage bonds. The Ohio Public Utilities Commission has authorized the issuance of $105,700 new capital stock in exchange for Liberty bonds of any issue, provided both stock and bonds are taken at not less than par. The company also may not dispose of the Liberty bonds for less than par, or at a price approved by the commission.

This is the first arrangement of the kind presented to or approved by the commission.

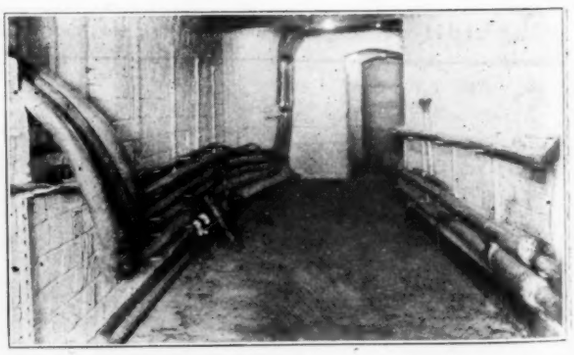
Wire and Cable Supplied to British Expeditionary Force.

During the war the British postal authorities supplied 40,000 miles of cable for use in the trenches by the British expeditionary forces, and 200,000 miles of overhead wire. The insulators supplied were between four and five millions.

Operators at Columbus, Ind., Granted Increase in Wages.

Operators employed by the Citizens Telephone Co.'s exchange at Columbus, Ind., have been granted a 10 per cent increase in wages, an eight-hour day, time and a half for Sundays and double time for holidays.

Eighteen of the nineteen operators presented their demands in writing, Thursday, July 31, to John L. Hosea, the manager, and threatened to strike if they were not granted. Mr. Hosea hurried to Indianapolis and conferred with E. L. Cline, superintendent, who went to Columbus and met the operators. Following a 30-minute conference, the demands of the operators were granted.



Cable Tunnel and Passageway Between the Main Building and Warehouse at Wooster.

Pennsylvania Associations May Join

Proposal Made at Quarterly Meeting of Western Pennsylvania Association in Jamestown, N. Y., July 25 and 26, That Eastern Association Be Invited to Join with It and Form One Association—Over 70 in Attendance at Meeting

One of the most successful meetings ever held by the Western Pennsylvania Independent Telephone Association was its quarterly session held at Hotel Samuels, Jamestown, N. Y., July 25 and 26, with an attendance of over 70.

An important matter brought before the association members at this meeting was the proposal that the Eastern Pennsylvania Independent Telephone Association be invited to join with the Western Association and form one association to be known as the Pennsylvania State Telephone Association. A committee comprising W. H. Wilson, chairman; C. M. Thompson and John H. Wright was appointed to take up this matter with the Eastern association.

An engineering committee was also created to render engineering advice to member companies contemplating mergers. This committee consists of W. H. Wilson, of Erie, Pa., chairman; T. F. Corliss, of Johnstown; Fred J. Heavens, of Pittsburgh; John H. Wright, of Jamestown, N. Y., and W. S. Paca, of Oil City, Pa.

The bill recently passed by the state legislature and signed by Governor Sproul July 22, permitting mergers of competing telephone companies in the state of Pennsylvania, was thoroughly discussed. It is believed that a number of competitive situations in the state will be cleared up within the next six months.

The rates put into effect by the Postmaster General were also approved by the telephone men assembled, and the association will recommend that they be continued.

W. J. Maddox, President of the Jamestown Telephone Corporation, Jamestown, N. Y. Entertained the Telephone Men and Women in His Home.

F. B. MacKinnon, of Washington, D. C., president of the United States Independent Telephone Association, was present at the Saturday morning session and spoke on a number of matters, particularly urging all telephone companies there represented, large and small, to join the national association.

After the Friday afternoon session the telephone men and women present were entertained at the residence of W. J. Maddox, president of the Jamestown Telephone Corporation. They were taken by automobile to his home in Jamestown, where he provided entertainment in the way of music and dancing. Later in the evening a buffet luncheon was served in his beautifully appointed grill room in the basement.

After the luncheon, the guests were taken to Mr. Maddox' garage where they supposed a photograph was to be taken. They received a delightful surprise when the curtains were drawn aside and players from the Celeron Theater presented a sketch from "Fair and Warmer." After the presentation of the sketch the photograph reproduced on this page was taken.

Estimated Deficit of British Telephone Operations.

Although the accounts for the British telephone and telegraph services for 1918-19 are not finally closed, the Postmaster General estimates that the telephone service will show a deficit of $2,130,000 ($10,650,000).

He says further: "It is clear, that in view of the increased war bonus now payable that both services must show a considerably larger deficit in the current year."

The telegraph service deficit is $5,671,000 ($28,357,000).

After a Luncheon Served in the Beautifully Appointed Grill of W. J. Maddox, a Photograph of the Group Was Taken in His Garage.

Fundamental Principles of the Telephone Business

A Reading Course Designed to Present Logically the Principles Which Underlie Successful Organization and Operation of Telephone Properties—Prepared Under the General Supervision of Stanley R. Edwards—This Section, "Part VII, Telephone Engineering Economics," Written by Chas. W. McKay

Quiz Questions on the Preceding Installment.

117. What interesting problem in dealing with human nature confronts the plant engineer in connection with house-cable work?

118. Present some arguments as to why the building owners should make proper conduit provision for taking care of the telephone wires and cables. Outline a method of persuading them to install such conduits.

119. Discuss the telephone wiring of small apartment buildings.

120. What is the accepted rule relative to the total amount of wire required for a vertical wire-riser distribution system for a small apartment building? What is the general practice as to the vertical conduit riser? How may the exchange cable be utilized to save horizontal wire runs in the apartment building?

121. Discuss the telephone wiring as shown in the floor plan, Fig. 46.

122. What usually brings about the installation of a house-cable system in old buildings?

123. What complicates the installation of a house-cable system in an old building? What is the first task of the plant engineer in taking up the wiring of an old building?

124. Where should riser cables be placed? What is the objection to the use of passenger elevator shafts in which to install riser cables? If neither freight nor elevator shafts are available, what other locations may be utilized for the riser cables?

125. What installation method should be used with cables placed laterally between riser cables and terminals? What alternative may be adopted? What is recommended as the best method?

CHAPTER IX. House Cable Systems (Continued).

126. *Terminals in old buildings.*—Terminals, where possible, should be located in readily-accessible hall closets or toilets. In such cases, the appearance of the terminal matters but little and the type best suited to the peculiar requirements of the case in hand should be used. In many cases, however, terminals must be placed in exposed parts of hallways and corridors and, for appearance sake, the plant engineer must be careful as to the type of terminal he specifies.

The terminal illustrated in Fig. 47 is for use in exposed locations. It is made of wood, stained to match the building woodwork, and should be placed high on the wall where it will be beyond the reach of the curious and as inconspicuous as possible.

The hinged door—not shown in the illustration—is frequently provided with

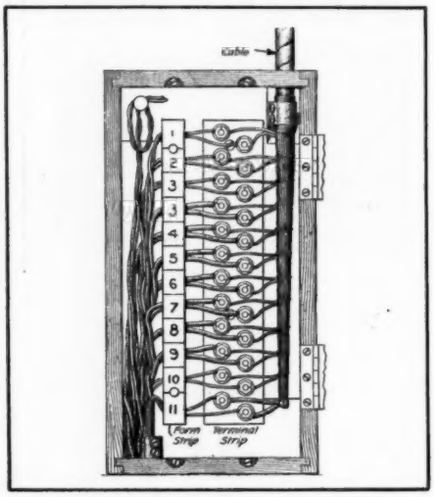


Fig. 47. House Cable Terminal for Exposed Locations.

a spring, so that the box will always be closed when not in use. The box is provided with the usual equipment of fanning and terminal strips.

127. *Simplifications in cabling old apartment buildings.*—The task of installing house cable systems in old apartment or hotel buildings is frequently simplified by the fact that work of this nature is done in connection with the remodeling or renovating of the building. In cases of this kind it is a comparatively simple matter to provide the necessary conduits and hall mouldings to completely conceal the cable and wire system.

The work of planning and installing apartment and hotel systems is further simplified by the fact that it is usually possible to definitely forecast the ultimate number of subscribers—this being one station per apartment, or one station per room in the case of a hotel.

The details of installing interior residence and apartment-house wiring will be discussed in connection with the subsequent installments on the general subject of "Construction Engineering." For the present, suffice it to say that the degree of skill attained by telephone installation men in concealing interior wires is astounding.

The writer has known of instances where expert installers have completely re-wired an apartment building in so deft a manner that it was subsequently well-nigh impossible to find evidence of the work, insofar as the defacement of the building was concerned.

128. *Placing and splicing house cables.*—The problem of installing house cables is more serious than may seem at first thought. Imagine splicing a large house cable in a comparatively small shaft! Obviously the working conditions are such as to almost preclude the possibility of good workmanship.

In the first place, horizontal splices are well-nigh out of the question and it is a well-known fact that splices made in a vertical position are the bane of a splicer's existence. It will be remembered that all cable splices are boiled in paraffin, and, obviously, if the splice is supported in a vertical position during the process of splicing, the paraffin will settle at one end of the splice. Again, even where horizontal splices are possible, the cramped working space available in the ordinary cable shaft renders the splicer's task exceedingly difficult.

For these reasons, and for others, it has become customary to splice house cables on the roof of the buildings for which they are intended, and, after the splicing process has been completed, to lower the whole house cable system into the shaft and then to properly secure it against possible future mechanical injury.

129. *Support of house cables in shafts.*—Various methods have been evolved for supporting house cables in shafts. Possibly one of the best is to attach the cable to a suitable messenger strand suspended in the shaft and properly secured at the upper extremity of the shaft. The house cable may be attached to the strand at frequent intervals and the strand, therefore, will bear the entire strain imposed by the weight of the cable eliminating the possibility of the cable failures which result from exceeding the tensile strength of the cable itself.

Of course, the cable might, in some cases, be supported by attaching it to

the face of the shaft by means of toggle bolts. This method, however, has proven unsatisfactory due to the fact that the toggle bolts frequently become loosened by the strain imposed upon them.

The suspension strand method of sup-

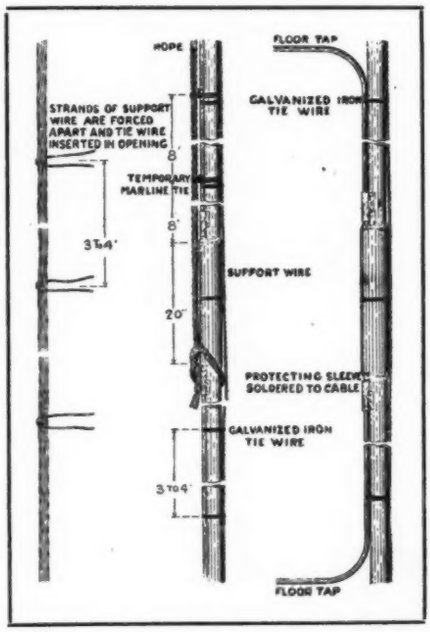


Fig. 48. Suspension Strand Method of Supporting Vertical House Cable in Shaft.

porting a vertical house cable in the shaft is illustrated in Fig. 48. It will be noted that the cable is attached to the strand by means of tie wires. These tie wires are attached to the strand by forcing apart several of the wires of which the strand is made up, and inserting the tie wire in the opening thus formed.

The strand is securely fastened at the top of the shaft by the method illustrated in Fig. 49. A channel iron, or I-beam, is placed across the top of the shaft. Over this I-beam there is laid the "saddle" used for supporting the strand.

The short end of the strand is securely fastened by means of the three-bolt clamps shown in the illustration.

130. *Splicing house cables.*—The problem of splicing house cables is frequently a complicated one. As previously suggested, lack of space in cable shafts frequently precludes the possibility of splicing the cable after it has been placed. The reason for this will be obvious when it is remembered that in order to obtain the best results, cable splices should be made in a horizontal position. Vertical splices are difficult to make and as a rule are most unsatisfactory.

The difficulties involved in splicing house cables in the shafts in which they are to be located have led to the almost universal practice of splicing the cable before it is placed. Frequently, house cables equipped with "stubs" to which to connect the lateral cables, are spliced upon the roof of a building and subsequently lowered into place in the shaft. Obviously the only splicing work that remains to be done is to join the lateral distribution cables, on each floor, to the stubs already provided in the riser cable.

131. *Avoidance of cable splices at each floor.*—To obviate the necessity of making a cable splice at each floor it is customary to supply distribution facilities for three or four floors from one splice. If such a scheme is adopted, it is only necessary to make a splice every three or four floors, or if the cable is spliced upon the roof, as already suggested, at such intervals that the splices, after the cable has been placed in the shaft, will be three or four floors apart. Such a splicing scheme is illustrated in Fig. 50.

It will be noted that the cable supplying feeder facilities—in this case a 400-pair cable—is terminated in a cross-connection box located in the basement of the building. The reason for the cross-connection box will be obvious when it is remembered that a cross-connection point between a distribution and a feeder cable nearly always results in flexibility in the system as a whole and frequently in a saving of feeder cable pairs, a point

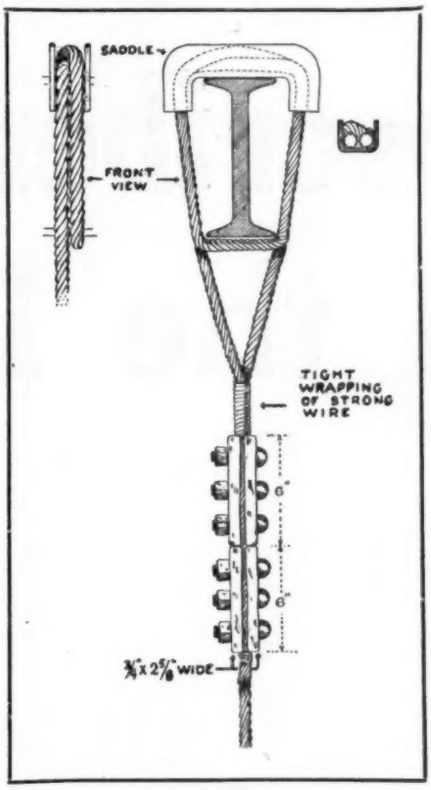


Fig. 49. Top Support of Cable Strand Showing Method for Securing at Top of Shaft.

well worth the careful consideration of any plant engineer. Furthermore, it will be noted that the first and second floors are fed directly from 25-pair cables terminating in the cross-connection box. This is good practice as it saves splicing and economizes pairs in the riser cable. The additional amount of 25-pair cables required is negligible.

From the cross-connection box, a 400-pair riser cable is extended to the splice located at the 4th floor; then a 300-pair cable to the splice on the 7th floor;

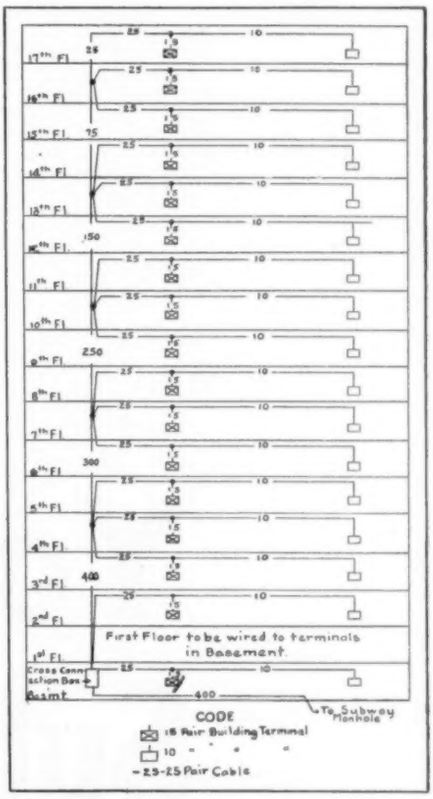


Fig. 50. Cabling Scheme for Avoiding Making of Splices at Each Floor.

a 250-pair cable to the 10th floor; a 150-pair cable to the 13th floor; a 75-pair cable to the 16th floor; and a 25-pair cable to the 17th, or top floor. In other words, this is the diminishing cable distribution system against which, it will be remembered, the writer harangued at some length in a previous installment of this series.

The reason for the use of this system will be obvious when it is remembered that the ultimate cable requirements of a house-cable system may be determined definitely in advance, except in rare cases.

If the plant engineer makes a careful study of the ultimate requirements of a given office or apartment building, it is a comparatively simple task to determine the ultimate *maximum* requirements. The *actual* ultimate requirements may be less than those presented by the plant engineer but there is no question but what the cable system will be large enough and that equipment riser cable additions will be unnecessary. Hence, in this particular case, there is no reason why the plant engineer should not economize by utilizing the diminishing cable distribution system.

(To be continued.)

You—Your Subscribers and the Dial

Please tell the Advertiser you saw his Advertisement in TELEPHONY.

THE Dial is an essential feature of the Automatic Telephone System. It completes the advantages which arise from modern central office equipment.

To **YOU** and your company, the Dial means freedom from operator worries and expenses,—for all local calls are made direct by the subscriber himself.

The Dial enables your exchange to give service whether your staff is on duty or not.

The Dial meets every emergency, every rush of traffic, whether during the normal busy hours or during the off-peak of the early morning.

With the Dial labor laws and disputes cannot disorganize your service and impose heavy extra costs which necessitate higher rates or diminished profits.

To your subscribers the Dial means quick, accurate, uniform, convenient service.

The Dial enables the users to make all calls promptly —there is no waiting for an operator.

The Dial **must** transmit the number called; it cannot misunderstand or make a mistake.

The Dial—being a mechanism—gives the same service day and night, at busy times and during slack periods. It is never hurried or flustered.

The Dial fits the peculiarities of each subscriber. Quick, nervous men and slow, deliberate ones are served equally well.

Subscribers who have used both services, prefer the Dial, and it pays the companies operating it big dividends in economy and service.

AUTOMATIC ELECTRIC COMPANY
CHICAGO

The Characteristics of Receivers

Determination of Electrical and Acoustic Characteristics of Receivers—Discussion of Various Measurements Involved—Acoustic Output and Efficiency of Receivers—Published by Courtesy of The Journal of the Franklin Institute

By Louis V. King

Associate Professor of Physics, McGill University, Montreal

Since its invention in 1877, the telephone receiver as originally developed by Alexander Graham Bell has come into almost universal use.[1] In almost all methods of transmitting intelligence by electrical means, it constitutes the final link

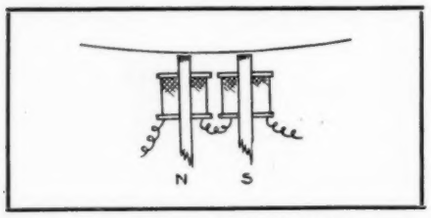


Fig. 1. Diaphragm Distortion.

whereby electrical energy is converted into acoustic energy and thus made perceptible to the ear as sound.

In recent years, with increasing ranges of transmission in telephony and radiotelegraphy, more attention has been directed to the telephone receiver itself as a vital part of the receiving apparatus in its essential function as a detector of extremely small variations of electrical energy. Regarding the telephone receiver as an electrically-operated acoustic radiator, it will be evident from results discussed in the sequel that much remains to be done in the matter of its improvement.

The writer, therefore, proposes to discus briefly the main features of the instrument in its present form with a view to directing attention to points requiring further investigation. No attempt will be made to treat the subject exhaustively in the scope of the present article, as several treatises are now available to readers interested in matters of detail.[2]

Elementary Theory of the Telephone Receiver.

In its essential mode of operation, the telephone receiver remains practically the same as when it was first invented. In the bipolar receiver, a thin circular diaphragm of soft iron (japanned or tinned to prevent rusting, about 5.5 cm. in diameter and 0.02 to 0.05 cm. thick) is firmly clamped around its outer edge and usually has its free period of vibration or resonance frequency in the neighborhood of 1,000 cycles.

The diaphragm is subjected to the pull of a permanent magnet having its poles close to, but not actually touching it. As a result, it is distorted to a slightly concave form, as indicated in Fig. 1. Surrounding the poles, and thus interlinked with the magnetic circuit, are wound two coils of silk-insulated or enamelled copper wire, each containing several hundred turns.

A small electrical current δi through the coils will result in a variation of the magnetizing force $\delta H \propto \delta i$ acting on the magnetic circuit. If B denotes the average flux density in the gap, it will be connected with the magnetizing force H due to the permanent magnet by some such curve as that shown in Fig. 2.

As H is altered slightly by the field δH set up by the current δi in the coil, it is seen that for small variations $\delta B \propto \delta H$, very approximately,* and hence $\delta B \propto \delta i$. If F denotes the total traction on the diaphragm due to the flux B, $F \propto B^2$ and $\delta F \propto 2B\delta B$, giving, finally, $\delta F \propto 2B.\delta i$.

Regarding the diaphragm as a static elastic system, the displacement $\delta x \propto \delta F$, from which it follows that $\delta x \propto 2B.\delta i$; in other words, under these conditions the to-and-fro motion of the diaphragm, giving rise to corresponding sound-waves, follows faithfully the variations of current represented by δi. It will be noticed that the one essential condition for this result is that there exist a constant permanent flux B in the gap as provided for by the permanent magnet.

The assumption involved in the statement $\delta x \propto \delta F$ is legitimate for vibrations of frequencies not too close to resonance, but ignores the dynamics of the diaphragm. Regarding the diaphragm as a vibrating system of one degree of freedom, its motion will be characterized by a differential equation of the type

$$md^2x/dt^2 + kdx/dt + \mu x = F \quad \ldots\ldots (1)$$

where m is a mass-factor, k a factor representing dissipation of energy due to acoustic radiation, air-friction, eddy-currents, elastic and magnetic hysteresis, etc., and μ a stiffness constant depending on the elastic constants and dimensions of the diaphragm, method of mounting, etc. F represents the traction on the diaphragm resulting from the variation of telephonic current as already explained.

A discussion of the consequences of equation (1) would carry us beyond the limits of the present article. It suffices to state that the motion of telephone receiver diaphragms has recently been studied in great detail by Kennelly and his pupils,[3], [4], [5] who describe experimental methods of determining the mechanical constants (m, k, μ) as well as the electrical constants involved in F of equation (1).

*In reality the small variations of B and H trace out a minute hysteresis loop detrimental to the exact reproduction of current fluctuations.

Measurement of the Electrical Characteristics of Receivers.

It is usual to specify a telephone receiver by its direct current resistance. Thus, ordinary telephone receivers vary in D.C. resistance from 25 to 100 ohms, while those employed in radio-telegraphy generally exceed 1,000 ohms.

Owing to the fact that the coils are interlinked with a magnetic circuit as in an ordinary transformer, it is to be expected that the resistance and inductance of the electrical circuit to an alternating current of pure wave-form will depend on the frequency. This dependence is further complicated by the motion of the diaphragm and by the eddy-currents generated in it by its motion in the field of the permanent magnet.

Owing to the variable reluctance in the air-gap of the magnetic circuit, the electrical constants will depend on the magnitude of the measuring current, which should be specified directly, or stated in terms of the voltage across the terminals of the receiver.

The actual measurements of the electrical constants of a receiver over the range of telephonic frequencies (100 to 2,500 cycles) was until recently a matter of some difficulty owing to the practical impossibility of generating high-frequency alternating currents of pure sine

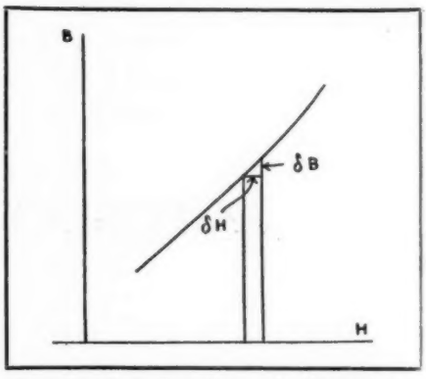
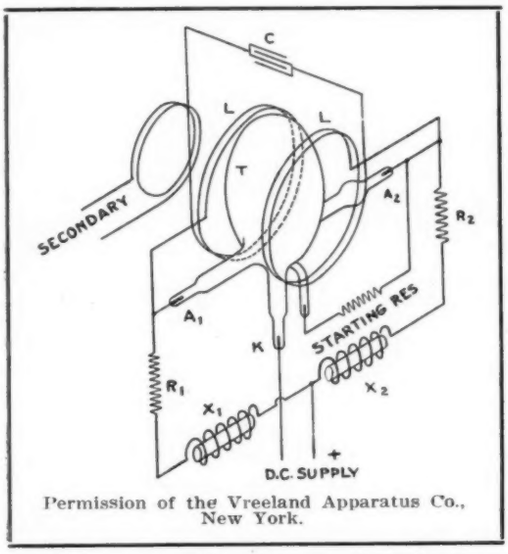


Fig. 2. Flux Density and Magnetizing Force.

wave form. This difficulty has now been eliminated by the introduction of the "Vreeland oscillator," an indispensable adjunct to telephone research equipment as a generator of alternating currents of

high frequency (300 to 2,500 cycles) and pure wave form.[5]

The essential feature of the apparatus illustrated in Fig. 3 is a capacity-inductance circuit in which electrical oscillations are generated by a mercury-vapor arc deflected alternately between two electrodes from a third by the magnetic field of the coil forming the inductance. The oscillations thus set up are self-perpetuating and may have their frequency adjusted to any desired value by varying the capacity and inductance of the oscillating circuit. A potential between six



Permission of the Vreeland Apparatus Co., New York.

Fig. 3. Theoretical Diagram of Vreeland Oscillator.

and 20 volts (on a high-resistance circuit) is obtained across the terminals of a coil closely coupled with that of the oscillating circuit. The purity of the wave-form is stated to be extreme, the most rigid tests having failed to detect any harmonics.

Such a source of alternating E. M. F. is especially well adapted to the measurement of inductance and resistance of telephone receivers by the Rayleigh bridge. The arrangement shown in Fig. 4 has been found to be most convenient for the purpose. P and Q are two non-inductive resistances, preferably adjusted to equality.

The coil to be measured, having resistance R and inductance L, is inserted in the third arm of the bridge while L_s, R_s represent a variable resitance and inductance inserted in the fourth arm. This is best provided for by a non-inductive resistance box connected in series with some form of continuously adjustable inductance such as the Ayrton-Perry inductometer.

The alternating potential is applied across BD, while a sensitive receiver is connected across AC. The inductance is first adjusted until minimum current passes through the telephone and the resistance then varied until the current is still further reduced.

Finally, after a series of successive settings of L_s and R_s, a very close approach to dead silence may be obtained in the telephone. As zero current in this part of the network implies equality of voltage and synchronism of phase at A and C, the condition for a balance is

$$R/R_s = L/L_s = P/Q \quad \ldots\ldots\ldots\ldots\ldots (2)$$

The electrical characteristics of telephone receivers as measured in this way have been studied in great detail by Kennelly and his co-workers.[6]

The results of a series of observations carried out in this way on a Bell bipolar receiver of 87 ohms D. C. resistance are shown graphically in Fig. 5. If I be the r. m. s. value of the alternating current and R the effective resistance at a given frequency, the electrical input is I^2R watts. If R_0 be the direct-current resistance, the corresponding copper loss is I^2R_0 watts. It may be mentioned in passing that the extent to which the alternating current resistance differs from the direct current resistance is a measure of internal energy losses and often serves as a rough indication of the relative merits of different types of telephone receivers.

Note on the Precision Measurement of Frequency.

In telephonic researches the exact measurement of frequency is of great importance, especially in studying the characteristics near resonance. A very satisfactory precision sonometer was devised by the writer for the purpose and is shown diagrammatically in Fig. 6.

One extremity of a fine steel wire (1.373 grammes per meter) about a meter long was fastened at A, the upper end of a vertical cathetometer scale. The

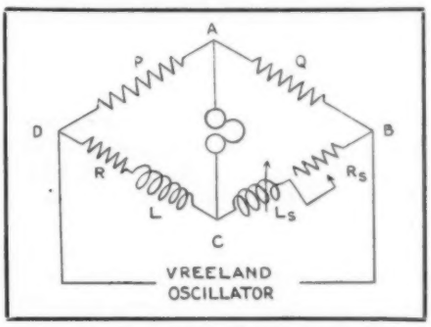


Fig. 4. Rayleigh Bridge Circuit for Measuring.

reading telescope was removed from the sliding support and replaced by a sharp bevel edge, C, about 4 cm. wide, constructed of brass. The same support carried a telephone magnet, T, mounted in such a way as to allow of vertical and horizontal adjustment.

The lower extremity, B, of the wire was firmly soldered into a short perforated copper plug (2 mm. diameter × 5 mm.) which could be screwed into the center of the upper end of a cylindrical weight w (188.2 grammes) carrying a hook in the center of its lower end as shown in the figure. To this hook could be attached a series of weights, W, (in practice a kilogramme weight was used).

The coils of the telephone magnet were connected through suitable resistances across the alternating e. m. f., and the movable bevel-edge adjusted up and down until the wire, BC, was set into vibration. The inertia of the mass, w, was so great

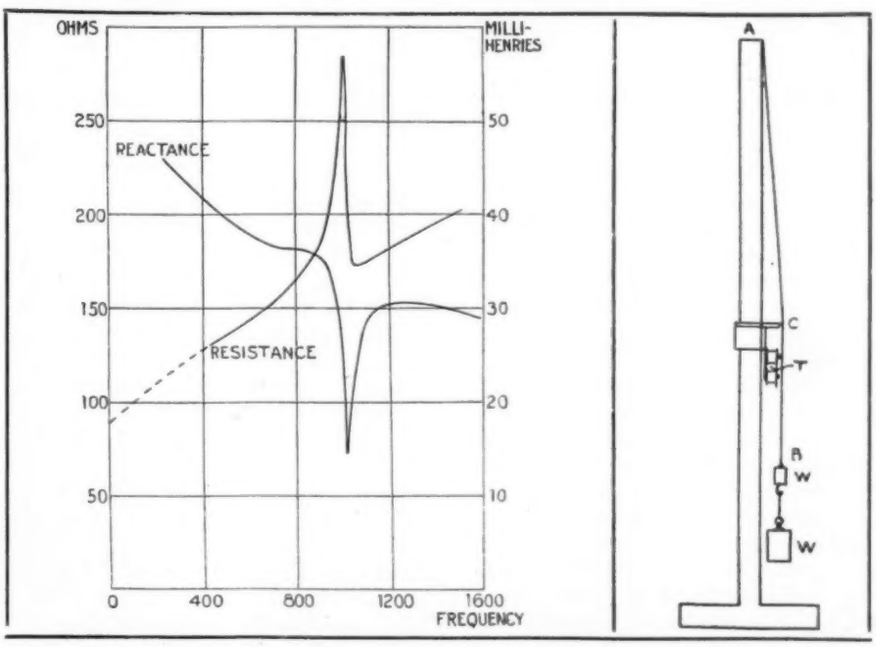


Fig. 5. Results of a Series of Observations on a Bell Bipolar Receiver.

Fig. 6. Precision Sonometer.

that the lower end, B, of the wire could be considered fixed for vibrations over the range of telephonic frequencies.

The length could be accurately read off on the cathetometer scale by means of the vernier, the zero having been determined by bringing the bevel edge into coincidence with B, the upper surface of the copper plug into which the wire was inserted.

Care was taken to leave the wire under full tension in the determination of the zero to allow for elastic stretching which was noticeable, as the wire was stressed to a degree not far from the elastic limit to obtain as great a length l as possible corresponding to a given frequency, given by the well-known formula

$$f = 1/2l.\sqrt{T/m} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

where T is the tension in dynes and m the mass of the wire per unit length.

As long as the vibrating portion remained less than 50 cm. in length, it was easily shown by calculation that variations in that of the upper inclined portion of the wire did not affect the value as read off on the cathetometer scale to one part in a thousand.

Owing to this particular method of mounting the vibrating wire, the length and tension were extremely determinate while dissipative forces were reduced to a minimum, with the result that the resonance was correspondingly sharp. It was found that the maximum resonance could be visibly altered by a variation of 1/10 mm. in a length of 30 cm. or by an alteration of 2 grammes in a tension of 1 kilogramme.

In the course of the writer's researches the instrument just described was found to be extremely convenient in frequency determinations over a range varying from 360 to 1,600, with an accuracy represented by an error less than one part in a thousand.

Measurement of Audibility Characteristics of Receivers.

Determination of Audibility Current and Voltage.—In many applications it is important to know the sensitiveness of a telephone receiver. This may be defined as the minimum electric energy required to give an audible sound. The current required to give a just audible sound is referred to as the *audibility current*, while the voltage across the terminals is similarly referred to as the *audibility voltage*.

It is to be expected that these characteristics will depend on several factors other than the design of the receiver, such as the sensitiveness of hearing of the observer, type of signal under consideration, existence and nature of extraneous sounds, etc. As far as possible a telephone receiver should be tested by an observer under the same conditions as those in which he will use the instrument in practice. As a receiver must in the last analysis serve to detect electrical currents by its effect on the ear, it is evident that an audibility test is the final measure of the effectiveness of the instrument for this purpose.

Several methods of testing telephone receivers have been described by various writers,[7] [8] [9] For details of the experimental arrangements, the reader is referred to the original papers. One of the methods most commonly used involves shunting the receiver by a non-inductive resistance until the telephonic current is so far reduced that the sound is rendered just audible. It is assumed that the current through the receiver may be calculated by the usual formulæ for inductive currents, the effective resistance and inductance having been determined by some such method as that described above.

In view of the high frequencies involved, special precautions must be employed in ascertaining that all the resistance-boxes are of negligible inductance. According to Lord Rayleigh,[7] resistance boxes of more than 10,000 ohms should not be employed, owing to the capacity effect of the insulation. Even if these conditions are satisfied, a further element of uncertainty exists, owing to the fact that the effective resistance and self-induction of the receiver are measured for currents of a few milliamperes and may differ considerably from the values corresponding to the audibility current—a possibility first pointed out by Austin.[9]

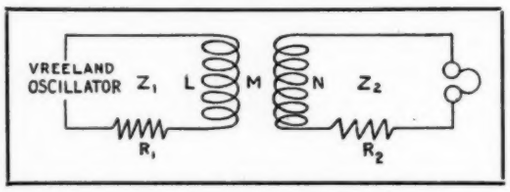


Fig. 7. Circuit for Determining Audibility Characteristics.

Further difficulties are met with in eliminating the direct inductive effect of the alternating current in the various circuits on the coils and diaphragm of the receiver itself, a source of trouble which is all the more difficult to eliminate as the receiver is more sensitive.

A simple method of determining the audibility characteristics of receivers was devised by the writer in the course of telephonic researches, in which the above-mentioned difficulties are almost entirely eliminated. The circuit is shown diagrammatically in Fig. 7.

A primary circuit of self-induction L, resistance R_1, and impedance Z_1, is connected across the terminals of the Vreeland oscillator, whose voltage V is measured by an electrostatic voltmeter. The telephone receiver is connected to form part of a secondary circuit of self-induction N, resistance R_2, and impedance Z_2, loosely coupled with the primary, so that M is small compared to L or N.

Audibility Voltage.—The telephone receiver is connected directly across the secondary, whose resistance and self-induction are both made small compared to that of the receiver itself. A non-inductive resistance R_1 of the order of a megohm* is inserted in the primary circuit, so that $Z_1 = R_1$ very approximately.

If x be the current in the primary, the voltage across the terminals of the receiver is $e = 2\pi f.M.x$ very approximately, while $x = V/Z_1 = V/R_1$ very nearly. Hence we obtain

$$e = 2\pi f MV/R_1 \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

In practice it is convenient to vary the mutual inductance until the sound in the receiver is just audible, when the audibility voltage may be obtained from (4) independently of the electrical characteristics of the receiver, if M is known experimentally or determined by calculation.

In the writer's researches, two coaxial coils were used, the primary of 341 turns having a resistance of 1.28 ohms, self-induction .0317 henry and mean radius 10.7 cm. The secondary consisted of a small coil (300 turns, 17.4 ohms resistance, 0.13 henry self-induction, 3.9 cm. mean radius) arranged to slide along a central rod so that the mutual induction with respect to the primary varied from 2.6×10^{-3} henry to 0.1×10^{-3} henry at 35 cm. distance between the coils.

From a calibration curve, M could easily be read off in terms of the distance between the coils.

To avoid direct inductive effects, it was found necessary to set up the testing apparatus at a considerable distance from the Vreeland oscillator (about 25 feet) and to bring the current to the primary through a twin wire cable enclosed in a grounded lead sheath.

Audibility Current.—In view of the fact already mentioned, that the effective impedance of a telephone receiver depends on the value of the measuring current and is uncertain (and probably not determinable) for audibility currents, it is unsafe to determine the latter from the audibility voltage. The audibility current may be determined independently of the electrical characteristics by a slight modification of the above apparatus. The current in the primary is given by $x = V/Z_1$, while the current in the secondary is given by $i = 2\pi f Mx/Z_2$. A high non-inductive resistance R_2 of the order of a megohm† is inserted in the secondary, so that $Z_2 = R_2$ very approximately, and in these circumstances

$$i = \frac{2\pi f M}{R_2} \cdot \frac{V}{Z_1} \quad \ldots\ldots\ldots\ldots\ldots\ldots (5)$$

*The resistance of a graphite pencil-mark along a groove cut into an ebonite slab is suitable for the purpose, as having negligible self-induction and capacity.

†The resistance of a graphite pencil-mark along a groove cut into an ebonite slab is suitable for the purpose, as having negligible self-induction and capacity.

a relation in which the impedance of the telephone receiver does not enter as long as it remains of the order of a few thousand ohms.

As before, M is altered until the limit of audibility is reached. In this case it may be necessary to make x fairly large to get an appreciable current in the high-resistance secondary. To avoid the direct inductive action on the receiver, it is advisable to connect it through grounded metal-sheathed cable and determine audibility at a considerable distance from the primary coil.

The electrical and audibility characteristics of a typical wireless telephone receiver tested by the writer is given as follows:

D. C. resistance of two receivers of headpiece in series 2,900 ohms.

At 1,020 cycles.

Effective resistance .....4,970 ohms } measuring current 0.79×10^{-6} amperes.

Effective inductance .....0.890 henry }

Audibility voltage .....9.0×10^{-6} volts

At 500 cycles:

Effective resistance .....4,210 ohms } measuring current 0.95×10^{-6} amperes.

Effective inductance .....1.140 henry }

Audibility voltage .....38.0×10^{-6} volts

On the Acoustic Output and Efficiency of Receivers.

Although it was pointed out many years ago by Abraham[10] that the acoustic efficiency of the usual type of telephone receivers was *at most* 1/700, little success seems to have been made in remedying the poor acoustic performance of these instruments. The ability of the telephone receiver to detect very small variations of electrical energy is due more to the extreme sensitiveness of the ear as an organ of perception than to any inherent excellence of mechanical or electrical construction.

The amplitude of motion of a telephone diaphragm for an easily audible sound is of the order 10^{-3} to 10^{-4} centimeter. The detailed study of diaphragm vibrations recently carried out by Kennelly and his collaborators has furnished the writer of this article with material for calculating the acoustic output and efficiency of the corresponding telephone receivers.

In a theoretical investigation by the writer, which it is hoped to publish shortly, the acoustic radiation from a vibrating diaphragm is calculated on the basis of Lord Rayleigh's theory.[11] The diaphragm is supposed to vibrate so that every part of its surface is oscillating in the same phase, an assumption which is legitimate as long as no natural overtones are excited. If W is the amplitude of motion of any point of the diaphragm, the *volume-displacement* is defined by

$$V = \int W dS \quad \ldots\ldots\ldots\ldots\ldots\ldots (6)$$

V represents the volume included between the equilibrium and extreme positions of the diaphragm. Provided the wavelength is large compared to the dimensions of the diaphragm, the energy radiated per second in a large open space is given by

$$[dw/dt] = \frac{1}{8} \frac{\rho_0 \pi^4 V^2}{\pi c} \quad \ldots\ldots\ldots\ldots\ldots\ldots (7)$$

where ρ_0 is the density of the medium, f is the frequency, $n = 2\pi f$, while c is the velocity of sound in the medium.

In a paper by Kennelly and Taylor,[4] explorations over the surface of a vibrating telephone receiver were carried out and the corresponding current was measured. For the details of the measurements, reference must be made to the original paper.

In particular a curve is given from which the mean amplitude at various radial distances may be obtained in the case of a bipolar 87-ohm, Bell telephone receiver vibrating without the cap over the diaphragm. The vibration contours were obtained at resonance frequency, $f = 992$ cycles, and show marked lack of symmetry owing to the magnetic tractions being applied over the two poles.

A rough calculation by quadratures gave for the volume-displacement, $V = 3.8 \times 10^{-3}$ cm.^{3} Writing $\rho_0 = .00129$ and $c = 3.3 \times 10^4$ cm./sec. for air at ordinary temperature and pressure, we obtain

$$[dw/dt] = 34.2 \text{ ergs/sec.} \quad \ldots\ldots\ldots\ldots\ldots (8)$$

Unfortunately the effective resistance of the receiver in question was not given, but the value at resonance for one of practically identical construction is quoted as $R' = 225$ ohms. The current $I = .00202$ ampere. Hence

$$(\text{electrical input}) = I^2 R' = 9120 \times 10^{-7} \text{ watts} = 9120 \text{ ergs/sec} \quad \ldots\ldots\ldots\ldots (9)$$

Comparing (8) and (9) we obtain for a rough estimate of the acoustic efficiency *at resonance* the ratio

$$\eta = .00375 \quad \ldots\ldots\ldots\ldots\ldots\ldots (10)$$

It is to be expected that the acoustic efficiencies at frequencies far removed from resonance will be very much less than the above value. In Table I of a paper by Kennelly and Affel[9] are given the effective resistances R' and maximum displacements $|x|$ at the centre of a receiver diaphragm (with cap in position) for various frequencies between 429 and 1137 cycles at constant current $I = .00204$ ampere.

As the volume-displacements are proportional to $|x|$ (assuming geometrically similar vibration contours over the frequency range) and the electrical power-input at constant current is proportional to the effective resistance R', it follows from (7) and (9) that the ratio of the efficiency at a given frequency to that at resonance is given by the expression

$$\frac{\eta}{\eta_r} = \frac{f^4 |x|^2 R'_r}{f^4_r |x_r|^2 R'} \quad \ldots\ldots\ldots\ldots\ldots\ldots (11)$$

where the suffix $_r$ refers to resonance conditions. Quoting a few values from Table I of the paper by Kennelly and Affel,[4] we derive the following:

Frequency cycles/sec.	R' ohms.	$\lvert x \rvert$ cm.	$\frac{\eta}{\eta_r}$	Remarks.
429	130	1.8×10^{-4}	.0016	Current $I =$
70	153	1.6	.0075	.00204 r.m.s.
804	166	1.9	.0175	amperes
923	193	2.85	.0580	throughout.
987	254	6.03	.256	Resonance
1020.4	224	10.45	1.000	frequency
1043	151	7.60	.857	1020.4.
1137	159	0.95	.018	

Keeping in mind that the resonance efficiency as already deduced is in the neighborhood of 4/1000, it will be deduced from the above table that the efficiency over the ordinary range of frequencies is extremely low, amounting to only a few parts in a hundred thousand or a million.

It is thus evident that the telephone receiver, considered as a means for transforming electrical energy into acoustic output, is an extremely inefficient instrument. It remains for future research to determine the location of the energy-losses and to remove their cause if possible.

According to some experiments by the writer, it appears that magnetic hysteresis losses are chiefly contributory. The depth of penetration of flux variations into the permanent magnet, due to high frequency telephonic currents in the coils, is very small, amounting perhaps to a tenth or hundredth of a millimetre. Unfortunately it is this flux variation which is effective in causing the diaphragm to vibrate, and only a moderate degree of improvement can be obtained by reducing eddy-currents by lamination.

The losses just referred to may be reduced to some extent by welding to the permanent magnet spool cores of low-hysteresis iron (such as silicon steel or vacuum-distilled iron). Unavoidable hysteresis and eddy-current losses are, however, set up by the vibration of the diaphragm in the strong magnetic field due to the permanent magnets.

In a recent paper by Kennelly and Nukiyama,[12] it is estimated that in the particular telephone receiver whose constants are quoted in the above table, 40 per cent of the electrical input is delivered at resonance to the diaphragm as mechanical output, including internal frictions and acoustic delivery. The estimate of acoustic efficiency at resonance calculated in the present paper (0.375 per cent) shows that only about one per cent of the mechanical power delivered to the diaphragm is converted into sound, the remainder being dissipated as heat by the action of elastic hysteresis, internal air-friction and eddy-motion, frictional losses at the clamped boundary, etc.

The problem of designing diaphragms to reduce these losses to a minimum, con-

stitutes, in the writer's opinion, a most important field of research connected with improvements in the acoustic efficiencies of telephone receivers.

For the intelligible transmission of speech the telephone receiver must respond without too great variation in loudness to a wide range of frequencies; or, in other words, resonance must not be too sharp. This requires a high degree of damping, involving large energy losses and inevitable low efficiency.

The case is otherwise when it is required to detect small alternating currents. As far as possible dissipative forces should be reduced to a minimum and the receiver should be designed to operate at the resonance frequency of the diaphragm. The less the energy losses and the greater the sensitiveness of the instrument, the sharper is the reasonance of the diaphragm.

The recent trend of radio-telegraphy in the matter of power economy and long distance transmission has led to a demand for increased sensitiveness in the receiving apparatus. This has been met by the introduction of current amplifiers of various types, giving magnification amounting in some instances to a hundredfold or more. The telephone receiver is, however, an essential part of the receiving apparatus and any marked improvements in its construction leading to higher acoustic efficiencies are greatly to be desired.

In the reception of radio-telegraphic signals involving the detection of periodic fluctuations of current, considerable gain in sensitiveness may be obtained by employing a receiver whose diaphragm is tuned to resonance with the frequency of the telephonic current. In a sensitive receiver in which energy losses are reduced to a minimum, the resonance will be fairly sharp.

In order to meet unavoidable variations of spark frequency occurring in practice, a receiver having a diaphragm capable of continuous tuning over a considerable range of frequencies would enable it to be always employed at maximum sensitiveness, an advantage which will be realized from an inspection of the table, in which a change of frequency from resonance at 1,020 to 987 cycles is shown to result in the reduction of efficiency to one-fourth of the maximum value.

It is hoped that the present article will serve to direct attention to the need for further research directed towards the improvement, in regard to acoustic efficiency, of existing forms of telephone receivers, in view of their almost universal use in radiotelegraphy and other forms of signaling across space.

References.

[1]An interesting historical account of the development of the telephone is given by du Moncel, "Le téléphone, le microphone et le phonographe," Paris, 1878.

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[11]Rayleigh: "Sound," 1896, Vol. ii, Art. 302.

[12]Kennelly, A. E., and Nukiyama, H.: "Electromagnetic Theory of the Telephone Receiver," Proc. American Institute of Electrical Engineers, Vol. xxxviii, April, 1919, pp. 491-539. Extensive references are made in this paper to the most recent researches on telephone receivers.

Utilities Must Have a Square Deal

As the Public Does Not Favor Government Ownership the Alternative Is to Afford Private Operators Adequate Rates—Editorial in Saturday Evening Post Vigorously Insists This Question Must Be Settled Soon

Reference was made in a previous issue of TELEPHONY to the growing tendency among thinking men to give the public utilities—the railroad, telephone, gas and electric light and traction companies—more consideration than they have been accorded in the past.

Further evidence of this welcome change of heart is furnished by a recent editorial in the Saturday Evening Post. Under the title, "Settle This," this influential weekly discusses the difficulties that burden many public service corporations, and declares that rate-fixing commissions should not only assure the utilities sufficient compensation to squeeze through and just escape bankruptcy but to yield a fair return on the capital invested.

The Post editorial says:

"What are commonly called public utilities—steam railroads, electric railroads, telegraph and telephone lines, electric light and power plants—were valued by the Census Bureau in 1912 at more than 24 billion dollars, which was nearly one-third the total wealth of the country aside from real estate.

If you take out real estate, farm equipment and products and personal belongings, such as clothing, furniture, vehicles—these public utilities account for nearly half the total wealth of the country. In one way or another every economic activity depends upon them. If they are managed wrong nobody can escape the consequences. They are all under public control.

Many people still want government ownership and operation — principally some labor people who regard government ownership as the easiest way to raise wages. It is a method by which labor can get one dollar at a cost of two dollars to the community, and that would finally be a bad bargain for labor itself.

Then there are noisy folks who want any sort of exciting change. They are only spectators. From their point of view the livelier the show, the better. That, at bottom, is why many of them are so sympathetic to bolshevism. It is an exciting act—for the safe onlooker.

But the country does not want government ownership. With the deficit of the railroads in government hands now running at the rate of 700 million dollars a year and many dissatisfactions over a service that costs 25 per cent more; seeing how many knots have been tied in the wire service in a few months; with the Shipping Board still the same sort of storm center that it has always been; and so on and so forth—the country is decidedly thumbs down to government ownership.

That means that these utilities, upon whose efficiency and sound growth the business of the country depends, must rely upon private capital. If they cannot attract private capital they cannot grow; their service must become increasingly inadequate with an increasing handicap on the country's industry."

The editorial then comments on the street railway situation in Chicago and New York, where niggardly treatment of the lines by rate-making bodies—caused, in part, by brazen stock-watering years ago—has made it difficult to finance the properties. In this connection it is only fair to point out that the telephone companies are in much better shape than most of the traction corporations, or, in fact, most other public utilities.

Speaking of the unwillingness of official bodies to increase rates, the Post says:

"Exceptions must be noted. In many localities regulatory bodies have met the situation raised by higher costs with genuine conservatism. But in many others they have not, and the ill repute of public-utility investments spreads. Electric railways of the country carried 14 billion passengers in 1917. To a majority of city folks they are fairly a necessity of life. One mile of them out of eight, the country over, is now in the hands of receivers. This includes some of the most important mileage, as in New York City. That is not encouraging to investors.

Many regulatory bodies, like the Interstate Commerce Commission formerly, take the question to be whether a public-service agency, under private ownership, can scrape through. If it can probably avoid actual bankruptcy, they give no relief. But that is not the real question. Just avoiding actual insolvency does not at all meet the situation. If public-service companies are put in a position where it is nip and tuck between solvency and insolvency private capital will not go into them. The harm has been done.

The public has a choice between two horses with which to do the day's work—public ownership or private ownership. For good reasons it chooses the private-ownership horse, and then hamstrings it. Rejecting government ownership the public must rely upon private capital for the maintenance and extension of these immensely important public services. If it does not make the conditions attractive to private capital, it simply breaks the staff that it has chosen to walk with. Barely scraping through, just avoiding bankruptcy, will not answer. There must be better assurance than that.

This is the gist of the railroad problem: The country does not want government ownership. The only alternative is reliance on private capital. Unless railroad investments are made attractive to capital, the public simply hamstrings its horse.

That is a bitter pill to our dinner-coat and patent-leather proletariat who do not want anything made attractive to private capital.. But it is the cold and fundamental fact in the whole public-utilities situation. Cant and demagogy will do what they can to mislead; our scant professional proletariat will obstruct as much as possible; some elected persons will have a haunting fear of being called friends of plutocracy; but if private capital is to be our instrument we must give it conditions in which it will function efficiently—not the mere breath of life but assurance that legitimate bond interest will be paid—and a fair show to earn dividends that can increase as a reward of good management.

If we are not ready to meet that condition squarely and without shuffling, we may as well hand the utilities over to the joy-riding theorists."

These are strong words, in the closing paragraph, but they are not illogical. However, there is little ground to fear that federal operation or ownership will be selected as the alternative to giving the utilities a living wage.

The government's experience in the railroad and telephone and telegraph fields the past year, it is believed, has been sufficient to prevent any extension of government control over public service corporations. As the Post editorial writer says, "For good reasons it (the public) chooses the private ownership horse." Common sense, which will ultimately prevail, will guard against the hamstringing of the private operators of utilities.

Commissions, Courts and Councils

Discussions and Rulings of State Bodies Having Supervision Over Telephone Companies—Decisions of Courts in Matters of Interest to Public Utilities and Actions of City Councils Relative to Franchises, Rates and Service

Indiana Companies Ask Continuance of Connection Charges.

Following the action of Congress in voting to return the telegraph and telephone systems to private control, 75 member companies of the Indiana Independent Telephone Association filed petitions with the Indiana Public Service Commission, last week, asking that they be permitted to continue the installation and service charges inaugurated by the federal administration December 1, 1918.

All the petitions are identical and were presented to the commission by Max Hosea, secretary of the Indiana association. It is understood that the commission will consider the petitions in a favorable light in the event it is shown that the revenue produced by the charges will tend to lower the exchange rates.

The service charges that the companies ask to retain are: Service connection, $3.50; moving instruments, $3.50, and change of name $1.50.

Company Allowed Tentative Reduction in Tax Valuation.

Following the filing of a suit in the Marion county (Ind.) circuit court, on July 23, in which the Chicago Telephone Company asked for an injunction restraining the Indiana state board of tax commissioners from certifying its assessment of the property of the company to the auditors of Lake, Newton and Porter counties, an agreement was reached between attorneys for the company and Attorney General Stansbury, whereby an assessment of $1,980,000 is to be certified and a restraining order issued withholding the valuation above that amount until it has been passed upon by the court. The board had fixed the assessed valuation of the company at $3,033,930.

Louisville Home to Increase Rates to Indiana Patrons.

The Louisville Home Telephone Co., which operates lines in New Albany, Sellersburg and other points in Floyd, Clark and Harrison counties in the southern part of Indiana, petitioned the Indiana Public Service Commission on Friday, August 1, for permission to establish a new schedule of rates, which will generally raise the charge for telephone service of that company in Indiana.

In New Albany the company wishes to base its rate schedule on the distance of the telephone lines. In the city within two miles the company asks the right to make the following charges: Residence, single line, $2.25 a month; residence, two-party line, $2.10; business, single line, $3.50; business, two party line, $3. The service outside of the two-mile zone would be higher, according to distance, under the new schedule.

Indianapolis Majority Stockholders Approve Sale.

The Indianapolis Telephone Co. has filed with the Indiana Public Service Commission a certificate showing that holders of more than three-fourths of the stock of the company have agreed to the sale of the company to the Central Union Telephone Co.

The certificate shows that of the 19,000 shares of preferred stock, holders of 16,688 shares, and of the 10,300 shares of common stock, holders of 10,144 shares consented to the sale. No votes were cast against the sale by stockholders as shares which were not voted were held by persons from whom no answer has been received.

Rural Subscribers Object to $1.50 Rate; Order Instruments Out.

Approximately 100 rural subscribers of the Fulton Telephone Co., at Fulton, Ind., are reported to have ordered their telephones taken out following the putting into effect by the company of a $1.50 monthly rate approved by Postmaster

General Burleson. The old rate was $1.15.

Manager Charles Becker says the instruments will be taken out as rapidly as ordered but that there will be an installation charge when requests are made for their installation. The rates in Fulton were also raised, but to date there has been objection only from the ruralites.

The farmers received their service for $1 up to last January, when the Indiana Public Service Commission increased the rate to $1.15. The income proved inadequate and Mr. Becker appealed to the federal administration for a further increase. It is understood the subscribers protesting against the higher rates, are to appeal to the Indiana Public Service Commission and state their side of the case.

Difficulty in Making Consolidation —New Petition Filed.

A lengthy petition has been filed with the Indiana Public Service Commission by the Community Telephone Co. of Whitley county, asking that the commission authorize the consolidated company to carry on the business under the new corporation name. The petition was filed on the ground that more people can be served under the consolidation plan than are being served at the present time.

The Community Telephone Co. is the result of an attempted consolidation at Columbia City, Ind., recently, of the Farmers Mutual Telephone Co. and the Whitley County Home Telephone Co. The consolidation was effected for a short time but was then opposed by some of the stockholders of the Farmers Mutual company. The date for a hearing on the new petition has not been set.

Inquiry of Rules of Telephone Service in Kansas.

General inquiry into the charges for telephone installations and for the changing of names for telephone use, and all rules of telephone service was ordered August 2 by the Kansas Public Utilities Commission. The inquiry will affect the 700 telephone companies of Kansas.

New Public Utilities Body for Massachusetts.

In the closing hours of the Massachusetts legislature of 1919 an act was passed which reorganized the machinery for regulating public utilities and abolished the gas and electric light commission and the public service commission.

A new department or public utilities has been created with a commission of five members, to be appointed by the governor with the consent of the council for initial terms of one to five years and a later standard term of five years. The yearly salary of the chairman is to be $8,000 maximum and those of the other commissioners are not to exceed $7,000 each.

All the powers and responsibilities of the two commissions new merged are carried into the new tribunal. Appeal from and enforcement of its decisions lie in the supreme court of the state. To facilitate its work, two commissioners may hear cases and on agreement of all parties one member may sit. Routine and administrative matters may be heard by one member.

It is expected that the reorganization will effect economies in administration and in rent. The salaries of the commissioners are to be paid from the tax levy and utility companies will no longer be directly assessed for these, as was formerly the case in the regulation of gas and electric companies. The consolidation of about 100 state departments into 20 has been effected by the act.

Michigan Commission to Set Aside Burleson Rates.

The Michigan Railroad Commission has decided to set aside the telephone rates fixed by Postmaster General Burleson, which representatives of the Michigan State Telephone Co. and other telephone companies had hoped to keep in operation until December. A new temporary schedule for the entire state will be prepared within two weeks, effective as of August 1.

In this connection the utilities board gave out the following statement, on August 2, signed by Chairman William M. Smith and Commissioners William W. Potter, Samuel O'Dell, Sherman Handy and Earl R. Stewart.

"The attorney general having advised the commission that the Burleson rates are illegal, the commission will proceed to prepare a temporary schedule of telephone rates for the entire state to take effect August 1, 1919, to supplant and take the place of the Burleson rates.

"This temporary schedule will be prepared with all possible speed and it is hoped to have it ready by August 15. The commission has a very keen appreciation of the possibilities of endless and expensive litigation arising over the telephone situation, and desires and expects to act in such a manner that this expense may be saved the states, municipalities and the telephone companies interested."

Michigan Commission Sets Aside Metered Service Rates.

The new Michigan Railroad Commission, in an order issued July 25, set aside the so-called Keiser order establishing metered service rates for the Detroit exchange of the Michigan State Telephone Co., which has been in constant litigation. The new order became effective August 1, simultaneous with the returning of the telephone properties to private control.

The question of the Michigan company's right to collect the metered service charges under the Keiser order, from March 1, 1918, to December 1, 1918, is still before the state supreme court, the recent order of the commission obviously not affecting that litigation.

In an opinion rendered to the commission recently, Attorney General Groesbeck declared Congress had no authority to continue the telephone rates put into effect by Postmaster General Burleson for four months after the government relinquishes control of the wire companies. Such an act, the attorney general held, violated the state's right to control intrastate business. Mr. Groesbeck ruled that telephone rates in effect before the period of government operation began should be declared in effect as of August 1.

Higher Minnesota Minimum Wage Scales in Effect.

Higher minimum wage levels, affecting nearly 35,000 women and minors employed in Minnesota industries, went into effect on August 5, under orders of the state minimum wage commission. Wages are based on 48 hours of work in a week, with allowances for overtime.

Many Minnesota employers have a wrong impression that there is a new state law limiting hours of women and children. The law is unchanged, limiting women to 54 hours a week in manufacturing and 58 hours in mercantile establishments, and minors under 16 to eight hours a day and 48 hours a week in cities of the first and second classes only—Twin Cities, Duluth and Winona. In other cities and villages throughout the state, the law limiting hours of labor does not apply.

New minimum wage requirements are made in two classes, one for cities of 5,000 or over and one for smaller places. The minimum in cities of 5,000 or over is $11 for a week of 48 hours or less, with 23 cents an hour for overtime. The apprentice rates apply for six months where employes are 18 or over, and for nine where employes are under 18.

Apprentices over 18 in cities are to receive $8.64 a week as a minimum for the first three months, with 18 cents an hour for overtime, and $10 a week for the second three months, with 21 cents an hour for overtime. Those under 18 will receive $7.20 a week for the first three months, $8.64 for the next three and $10 a week for the final three months of the nine months' apprenticeship. The rates for apprentices were increased somewhat by the commission over the first tentative rates made, but the apprenticeship period was made three months longer.

In places of less than 5,000 population, the new minimum wage rates are as follows:

Experienced employes, $10.25 a week for 48 hours a week or less and 21.5 cents an hour for overtime.

Apprentices over 18 years, first three months $7.68 a week and 16 cents an hour for overtime; second three months, $9.12 a week and 19 cents an hour overtime; apprentices less than 18 years old, first three months $6.48 a week and 13.5 cents an hour for overtime; second three months, $7.68 a week and 16 cents an hour for overtime; third three months, $9.12 a week and 19 cents an hour overtime.

Eliza P. Evans, secretary of the commission, is quoted as saying that all these rates have been based on a study of minimum living costs. They are about two months behind the times, so a revision may be necessary later.

Allowances are made by the commission in cases where rooms and board are furnished by employers, or board only. In cities of 5,000 or over, the allowance is $7 a week for room and board, leaving $4 of the $11 wage for other purposes. Where only meals are furnished, employers are allowed to deduct 22.5 cents a meal for not more than 21 meals in a week.

The allowances in towns under 5,000 is $6.25 a week for room and board, leaving a $4 margin out of the $10.25 minimum wage, and 21 cents a meal for board only.

A special rule is made for telephone operators working in small exchanges between 6 p. m. and 8 a. m., who are allowed to sleep and need to answer emergency calls only. It is provided that they may be on duty 12 hours and receive eight hours' pay.

Temporary Rates Based Upon Increased Operating Costs.

The petition of the Rochester Telephone Co., Rochester, Minn., for authority to place in effect increased rates has been granted by the Minnesota Railroad & Warehouse Commission.

The company is permitted to place in effect, as of August 1, and to continue for a period of one year, the following rates for local exchange service in the city of Rochester:

	Per month.
Individual, business	$3.75 gross
Two-party, business	3.25 gross
Individual, residence	2.25 gross
Two-party, residence	2.25 gross
Four-party, residence	1.75 gross
Rural multi-party (company-owned)	1.75 gross
	Per annum.
Rural switch per station	$4.20 net

Such other rates for the various classes of service, as are covered by the petition, are also approved. The customary discounts for prompt payment are allowed on all gross rates.

Before the expiration of one year from the effective date of this order, if not otherwise ordered, the company is to present a physical valuation of its properties, together with operating statements to the commission, for the purpose of further substantiating the rates allowed.

The company's application for an increase in exchange rates was based upon increased costs of operation. It has let contracts for a new office building and central office equipment in order to keep pace with the development of the service in Rochester. It did not present any valuation of its property, but supported its book value with plant measurement data and statements of its station growth. The figures from December 31, 1916, to December 31, 1918, showed an increase of 689 telephone stations, with a corresponding increase in switchboard, cable and wire facilities.

A wage increase which was placed in effect May 1, 1919, will cause an increase in the operating expenses of approximately $5,500 per year, the figures submitted showing the results of operation, comparing 12 months in 1918 with three months of 1919, shows a loss of approximately 50 per cent in the net return, or a reduction from 8.2 per cent to 4 per cent. This three months' period of 1919 does not include any of the wage increase which would absorb the entire net earnings of the company, leaving nothing for interest on outstanding obligations or dividends.

There has been a very heavy telephone growth in Rochester, which makes it necessary for the telephone company to carry a large investment in plant and equipment in order to meet this public demand. The company, the commission states, should have a return on its present investment that will induce financiers to furnish the funds necessary to meet the needed requirements.

The rates asked for are simply temporary rates to be put into effect until such time as the company has its new office completed and in operation, at which time it will present a valuation of its properties and a record of its operations for a readjustment of its rates.

The book value of the plant, as shown by exhibits filed with the commission, is approximately $263,000, or a cost per station of $76.22, there being 4,203 stations.

Telephone Operator Wins Minimum Wage Verdict.

The first suit brought by a telephone operator in Hennepin county, Minn., under the provisions of the minimum wage law was heard July 18 in conciliation court by Judge T. H. Salmon.

Complaint was filed by Inez Oakes, formerly telephone operator at the Randolph apartments, against her employer, John Axelmaker. The girl charged that during the three weeks of employment at the apartments she was paid $7.50 a week, whereas the scale set by the state minimum wage commission calls for $8.75.

In his defense, Axelmaker testified that the girl was privileged to do outside work during her spare time. Judge Salmon awarded the girl a $4 judgment.

Service Connection Charges Not Approved—Evidence Insufficient.

The Minnesota Railroad & Warehouse Commission has denied the application of the Viola Telephone Co. to place in effect at Eyota, Minn., installation and move charges as follows:

Installation charge for individual and party line service	$ 3.50
Installation charge for extension stations	3.50
Change of telephones	1.50
Moving telephones on same premises	1.50
General call	1.00

The company requested that the application for the installation charge be amended to apply to all subscribers at the time the installation is made, but to be refunded in the form of telephone rental, provided the subscriber retains the service for a period of one year.

No records were kept by the company to show the number of installations, or the number of telephones moved during the year, or of any loss sustained due to subscribers moving from one location to another, or from subscribers who retain their service for a short time only. The company also is not keeping its records in accordance with the uniform system of accounts prescribed by the commission.

The commission held that the burden of proof as to the necessity of the charges applied for lay entirely with the applicant, and that the evidence submitted did not support the petition. The application was therefore denied.

The company desired to make a charge to all persons wishing to place a general call over its rural lines. In the past, such calls have been made by subscribers and others without extra charge. This practice, the commission ruled, results in retarding the service because the operators personally deliver the message to the subscribers, thereby neglecting other calls which come in during this period.

The commission expressed its opinion that such a practice is a detriment to the service, and that if it is the desire of the subscribers and others to call subscribers throughout the rural districts for advertising purposes or otherwise, they should place their calls in the usual manner, and not burden the telephone company with this extra labor at the expense of the service.

Accountant Sent to Make Reports at Delinquent's Expense.

Expert accountants are being sent over the state by the Minnesota Railroad & Warehouse Commission to prepare annual reports for telephone companies failing to comply with the state law requiring

such reports to be filed with the commission.

The entire extent of the examination, including the railroad fare and personal expenses of the examiner, will be charged to the delinquents, the commission being authorized to use force if necessary to collect charges.

Rate Increase Granted to Jefferson City, Mo., Company.

The Capital Telephone Co. of Jefferson City, Mo., was given permission to increase its rates 15 cents per month in an order handed down recently by the Missouri Public Service Commission. The rates became effective August 1 and are to remain in force 13 months. If at the close of that period the telephone company finds the higher rates are not necessary, it will restore the former schedule.

A charge of $2.50 is made for the installation of extension telephones. The new rates are as follows:

Business, direct line	$2.65
Business, two-party line	2.15
Business, extension	1.00
Business, trunks	5.00
Residence, direct line	2.15
Residence, four-party line	1.55
Residence, extension	.50
RURAL.	
Class A	.50
Class B	1.65

A discount of 15 cents is allowed for payment by the 10th day of the succeeding month, extension sets and Class A rural subscribers excepted.

Court Grants Traction Company Increased Fares.

Holding in effect that where the Neb. State Railway Commission declines to act on an emergency rate application by a public utility and such refusal to give prompt relief imperils the financial standing and the future of the corporation, the courts will take charge, three federal judges have taken jurisdiction over the case of the Lincoln Traction Co., and have authorized it to charge six and seven cents, dependent upon the zone served, as a schedule of fares.

The commission had primarily refused to grant any increase in a rate dating from 1909 unless the company would eliminate all common stock and require the return from common stockholders of all dividends paid. The state supreme court told the commission that it had no concern with how the stockholders divided up the returns on their property; that the company was entitled to receive a reasonable return on the present value of the property, which it suggested was 8 per cent at the present time, and directed further proceedings, the state constitution preventing it from making a rate.

The commission had meanwhile allowed a one-cent increase in rates as an emergency, which was all swallowed up in increases to labor, and said that as the court had said the return must be on the present value an inventory was necessary to ascertain what property it had. The company then went into federal court, setting up that this order for an inventory meant a delay of months, during which time the corporation was certain to go upon the financial rocks.

The case has been followed with great interest by public utility men because of the claims made by the state railway commission in the past that it has the power to control the inner workings of common carriers which includes stock issues and the limiting of returns on the stock instead of upon the investment, and also its claim that it is the dollar invested that must be taken care of at all times, whether the value of the property goes up or down according to current reproduction costs, and not present value upon which returns should be computed. It lost on both these points, while the third one involving the ownership of surpluses was left undecided.

The federal court retains jurisdiction of the case to the end that complete justice is done the utility, but directs it to proceed with all practical expedition before the commission in order that final determination may be had and the value of the property shown. It holds that the company has established its good faith and the reasonableness of its claims so far, and enjoins the commission from inflicting any penalties upon it because the rates allowed by the court are higher than those the commission had allowed.

As one result of the long-standing lawsuit, the city council of Lincoln has voted to submit to the voters in November the question of buying the property.

Telephone Company Not Liable for Negligence.

Where a boy climbed a telephone pole, and crossed over to an electric power pole standing near it, and was injured by highly charged wires thereon, the negligence of the telephone company could not be predicated on its act in placing its pole close to that of the power company.

Its own wires not being highly charged, the company was not bound to foresee injury from wires not its own.—Robertson vs. Rockland Light & Power Co.; Supreme Court of New York; 176 New York Supplement, 281.

Increased Rates Allowed, Effective When System Is Metallic.

The Ainsworth Telephone Co. has been granted permission by the Nebraska State Railway Commission to increase its business rates from $2 to $3 a month; individual residence from $1.25 to $2 and to offer a business extension service at $1, with four-party residence at $1.50 and desk sets for 25 cents. A discount of 25 cents a month is to be given for advance payments.

It was ordered that this schedule should not go into effect until the company has completed the changing of the exchange to a common battery metallic service. Ninety per cent of the patrons petitioned for the change. The gross revenue of the company for 1918 was $7,071.96, and the deficit, including proper returns, was $276.75. The company was ordered to file the cost of additions and betterments and to furnish proof of the disposition of funds.

Decision Given on Part of Rate Case, Jurisdiction Retained.

The Nebraska State Railway Commission has issued an order permitting the Callaway Telephone Co. to increase its business rates to $2 a month, beginning with the first day of the month following its conversion of that part of its system serving these subscribers to a metallic system, due showing to be made of such completion to the commission prior to the going into effect of the rate. The company is also empowered to charge 25 cents per call for all calls between 10:30 p. m. and 5:30 a. m., and interest at the rate of 10 per cent on delinquent accounts of $50 or more.

The commission also ordered that jurisdiction of the matter be retained for the purpose of making an inventory and valuation of applicant's property and such modification of its rates as may be found necessary thereafter. Part of the application was pushed only at this time, but a revision of all rates will be asked in the near future.

The delay was occasioned by the fact that officers of the company have asked for an allowance of $13,424 for salaries earned in the past but not collected. H. H. Andrews, as secretary and manager, asks for $500 a year for the first three years and $900 for the remaining 12 years; Mr. McConnell, as manager, wants $500 a year from June, 1909; the treasurer wants $25 a year, and each of the directors $15 a year for varying terms. The total is $16,340, and from this is deducted the $3,000 received in cash.

The commission says it is unable to make a finding as to the value of these services owing to the absence of an inventory and valuation, but that such a finding is necessary for the purpose of the application. It says it is apparent that at least the greater part of the value claimed for the property belongs to the owners, and that the revenues to be derived from the increased rates are insufficient to yield an abnormal return on that value. It states that Andrews' claim of $100 a month at present is excessive, and that $50 a month would be liberal under the circumstances. Taking into consideration the increased costs of operation, the commission figures expenses

including 8 per cent on $10,000, which is $2,000 less than the company says is the present value of the plant, for the year at $5,412.65 with revenues of $5,007.49, or a deficit of $405.16.

The company serves 234 subscribers in Callaway and 400 switching subscribers that are organized into farmers' companies. The system was of the grounded magneto type until recently when that part serving the business section was converted to a metallic basis. The present rates are: Business, $1.50; residence, $1; switching, 25 cents. The plant was instituted in 1902, and a village ordinance permits a charge of $2 for business and $1.50 for residence, provided full metallic service is given.

Commission Demands Improvement in Telephone Service.

Formal demand for immediate measures looking toward improvement in the service of the Southwestern Bell Telephone Co. is made in a letter sent by the Oklahoma Corporation Commission to John M. Noble, general manager of the company, on July 26.

The letter was written following receipt of hundreds of formal and informal complaints from all sections of the state, vigorously protesting against the class of service now being given by the telephone company. Unless there is immediate improvement in the service formal action by the commission will be taken, it is asserted.

North Dakota Compensation Alleged to Be Unconstitutional.

Associate Justice L. E. Birdsell of the North Dakota Supreme Court, on August 1, issued an alternative writ, directed to the Workmen's Compensation bureau, commanding members of the bureau to appear before the court September 5 and show cause why a writ of injunction prohibiting them from enforcing the compensation law adopted by the last legislature should not be granted.

Application for the injunction was made in behalf of Henry Amerland, of Fargo, who employs two stenographers. He contends that his business contains no hazardous elements; that the duties of his employes are purely clerical and that many other employes in North Dakota are similarly engaged, but that nevertheless the workmen's compensation act requires every employer of such labor to become liable for the payment of premiums into the workmen's compensation fund, which he declares is unconstitutional.

South Dakota Rural Line Company Ordered to Treat Public Alike.

The Vincent-Bethel Telephone Co., which owns and operates a rural line extending in a westerly direction from Sioux Falls, S. D., to Ellis and beyond, has been ordered by the South Dakota Railroad Commission to supply service to H. C. Hyde, whose residence is within approximately ½ mile of one of the company's lines.

The company had denied him service on the grounds that it is a co-operative and not a commercial organization, maintaining a line for the convenience of its members, and that the complainant's residence is nearer the line of another company. This line, however, would not meet his requirements, as it does not have connection with Sioux Falls. He offered to pay for the construction of the line, or purchase a share of stock, or anything else within reason in order to secure the service.

At the hearing on June 20, it was brought out that recently, and since the complainant made application for service, extensions have been made and service granted to new subscribers. It was also clearly shown that all of the subscribers are not members or shareholders in the company; that at least two of the subscribers are non-shareholders and receive service upon the payment of an annual rental.

The commission ruled that the position of the company with reference to the duties and responsibilities which it owes to the public is clearly untenable under the state statutes. The contention that the line is overloaded, the commission considered as untenable and unreasonable and more in the nature of an excuse or an evasion than a legitimate reason why service should not be established and maintained.

Hearing on Wisconsin Minimum Wage Order in September.

That there will be no change in the minimum wage order of 22 cents an hour for women and minors, was indicated following the hearing on August 4, at Madison, Wis., to which a number of manufacturing plants sent representatives asking that the time of putting the order into effect be delayed until January 1. A conference was held by industrial commission with the advisory wage board on Monday evening. It was announced at the industrial commission Tuesday that no definite statement with reference to the matter would be issued until the return of Commissioner Fred M. Wilcox.

Announcement was also made that the hearing on the protesting telephone companies would not be heard for one month. It is understood, however, that the order of the commission with reference to telephone companies, when made, would be retroactive and would apply to the situation as of August 1.

Most of the protests at Monday's hearing asked that the date of putting the order into effect be delayed until January 1, the argument being that there were many contracts made on the present wage scale. After the hearing the commission and the advisory board held a long conference and the impression gained is that the order will not be modified.

Wisconsin Commission Authorizes Increases for Two Companies.

The Wisconsin Railroad Commission has authorized increases in rates of the New Union Telephone Co., at Dodgeville, and the State Long Distance Telephone Co., Elkhorn.

The Dodgeville company is authorized to raise switching rates to $5 and put in effect at Dodgeville the following schedule: Business lines, one and two party, $2.50 and $2.25 monthly; residence lines, one and two party, $1.90 and $1.65; rural grounded lines, $5.25 per quarter; rural metallic lines, $5.75 quarterly.

At the Berneveld exchange, business rates will be $25 a year, residence rates $18, and switch charges $6.

The Elkhorn company, with a new common battery switchboard for city service, has been allowed approximately 50 cents per month increase over the new rates allowed for magneto service. The rates range from $1.35 month for telephones on four-party selective ringing circuits to $4.40 per month for private rural lines less than four miles in length.

Summary of Commission Rulings and Schedule of Hearings.

ARKANSAS.

August 4: Hearing on the new rate schedules announced by the Home Telephone Co., operating in Gentry, Springtown, Cave Springs, Highfill and Elm Springs, and the Judsonia Telephone Co., operating in Judsonia, suspended by the commission pending investigations as to their reasonableness.

GEORGIA.

August 5: Hearing on the application of the Southern Bell Telephone & Telegraph Co., for an order making permanent the increased rates authorized by the Postmaster General in its exchanges throughout the state.

ILLINOIS.

July 26: The commission authorized the Brimfield Telephone Co. of Brimfield, Ill., to purchase the Milbrook Telephone Co., and to issue an additional $1,000 of its capital stock.

August 2: The commission approved the purchase by the Central Union Telephone Co., of the property of the Rockford Home Telephone Co. of Rockford, Ill. It also authorized the Central Union company to put into effect in Rockford and vicinity a schedule of increased rates, as follows: Residence individual line, $33 a year; two-party line, $27; four-party, $24; business individual line, $60; two-party, $51; rural residence, $24; business, $33.

September 12: Hearing on the petition of the Chicago Telephone Co. asking that the telephone rates put into effect by the Postmaster General be continued upon the return of the systems to their respective owners, August 1. On July 31 the commission made the following modifications in the Burleson rates, effective until November 30:

The guarantee by users of four-party, nickel service telephones is reduced from 40 calls at $2 per month to 30 calls at $1.50.

All Mr. Burleson's installation and moving charges are abolished and the company returns to its original fees.

Excess charges for "person to person," and appointment calls by long distance wires are declared void where messages originate and are received within the state and the company is directed to furnish such service upon request.

INDIANA.

July 23: Petition filed by the Central Union Telephone Co. for permission to make permanent the rates authorized by the Postmaster General for Averyville, East Peoria, Bartonville and Peoria Heights, during the period of federal control.

August 1: Petition filed by the Attica Telephone Co. for permission to increase its rates.

August 1: Application filed by the Louisville Home Telephone Co. for approval of new rate schedules for service to patrons in New Albany, Sellersburg, and other points in Floyd, Clark and Harrison counties.

August 1: Petition filed by 75 member companies of the Indiana Independent Telephone Association asking that they be permitted to continue the installation and service charges inaugurated by the federal administration December 1, 1918.

August 1: Certificate filed by the Indianapolis Telephone Co. showing that holders of more than three-fourths of the stock of the company have agreed to the sale of the company to the Central Union Telephone Co.

August 7: Hearing on the application of the Peoples Union Telephone Co. of Pekin, for permission to increase rates.

KANSAS.

August 2: The commission ordered a general inquiry into the installation, change-of-name and other service charges of the telephone companies operating throughout the state.

September 9: Continued hearing in the matter of the application of the Southwestern Bell Telephone Co. for an order permanently approving the rate schedules established by Postmaster General Burleson. Some 76 cities and towns are affected by the application.

MICHIGAN.

July 25: The commission set aside the Keiser order establishing metered service rates for the Detroit exchange of the Michigan State Telephone Co.

MINNESOTA.

July 29: The commission ordered the Clover Co-Operative Telephone Co. to restore telephone service to Barney Webber and Charles P. Webber at their farm near Pine City, upon the payment of any sum which may be due for service only. Service was disconnected on account of the alleged failure of the respondents to pay a fine imposed by the telephone company for the violation of certain rules. The commission found that the rules claimed to have been violated have never been filed with it and are, therefore, without legal force and effect.

August 12: Hearing at Kenyon on the application of the Kenyon Telephone Exchange Co. to increase its local and rural rates.

MISSOURI.

July 21: The commission granted permission to the Capital Telephone Co. of Jefferson City, Mo., to increase its rates 15 cents per month, effective August 1.

NEBRASKA.

July 26: Protest of Charles E. French of Kennard, against action of Blair Telephone Co., in transferring certain subscribers to Arlington Telephone Co.; dismissed, no cause of action.

July 26: In the matter of the appeal of the Farmers' Independent Telephone Co. of Red Cloud, from decision of commission ordering interchange of service at Red Cloud with the Lincoln Telephone & Telegraph Co.; commission approves bond of $5,000 conditioned upon payment of all losses sustained, and appeal allowed.

July 26: Complaint of L. E. Jackson against Northwestern Telephone Co. of Neligh, alleging poor service as result of outworn switchboard; satisfied and dismissed.

July 28: Complaint of F. A. Russell of Clearwater, against Northwestern Telephone Co., in regard to a dispute over what conditions may be imposed for farm service; satisfied and dismissed.

July 28: Application of Arlington (Nebr.) Telephone Co. for permission to increase rates 25 cents a month; showing of revenues and expenses, and that company was unable to secure sufficient help to maintain property. Revenues for the year totaled $10,391, and of this sum $2,256 was paid Nebraska Telephone Co. for tolls collected.

July 28: Final disposition and dismissal of complaint of Harry Widman of Mead, against Lincoln Telephone & Telegraph Co., alleging excessive installation charges. Widman demanded the right to move his own telephone, but the commission said that could not be permitted.

July 28: Application filed by Nebraska Telephone Co. for permission to destroy records no longer useful.

July 28: Application of the Unadilla (Nebr.) Union Telephone Co., for permission to increase rates to $1.25 and for an adjustment of stock issues; company permitted to amend its application by asking for a business rate of $1.50, residence and farm rate of $1.25, 25 cents a month for extension bells and 10 cents for each call between 11 p. m. and 6:30 a. m. Testimony taken of Thomas Rodaway, president, and Ernest E. Stouffer to the effect that certain earnings had been put into the plant in lieu of payment of dividends and valuable services performed by stockholders for which no payment had been made. A stock issue covering these was asked for.

July 28: Application of Farmers' Mutual Telephone Co. of Springfield, through Charles W. Sack, to cancel switching charges at Springfield, of the Nebraska Telephone Co., and restore special 5-cent call rate. F. A. May appeared for Nebraska Telephone Co. and R. E. Mattison for intervenor, Lincoln Telephone & Telegraph Co.; no testimony taken, but conference held; commission holds that complainant's position is not well taken and directs that order remain as previously issued.

July 29: Application of Comstock, Kearney, Beaver City and Arcadia telephone companies for extension of time for service connection charges; dismissed because covered by Resolution No. 50.

July 30: Application of Buffalo County Telephone Co. of Pleasanton, for increase in rates. Secretary M. S. Bocher appeared for the applicant and gave testimony; taken under advisement.

July 30: Application of Walnut Grove Telephone Co. for permission to establish gross and net rates, gross rate to be 25 cents a month higher unless paid before the last day of the quarter when service was rendered; commission holds that this is not a standard rule, but is not objectionable; directed that authorization be granted.

July 30: In the matter of the complaint of the Gandy Switchboard Co. against the Tri-County Telephone Co. of Stapleton; affidavits and motions filed and submitted and cause set for hearing Aug. 14th, location to be fixed later.

July 31: Application of the Republican Valley Telephone Co. of Franklin, for permission to increase stock from $10,185 to $14,850, the money to be used for extensions and betterments. The company also asks for permission to provide that subscribers shall pay a penalty of 25 cents a month for failure to pay by the 15th of each month, in order to stop delinquency among subscribers.

October 15: Hearing on proper basis for service connection, move and change of name charges.

PENNSYLVANIA.

July 23: Petition filed by J. A. Putnam of Rome, for permission to sell his system, known as the Rome Telephone Co., to the Rome Telephone Co. This is the first application received by the commission from an individual for permission to sell to a corporation.

July 23: Application filed by the Smithfield Telephone Co., operating in Monroe county, for permission to increase rates.

July 26: New rate schedules filed by the United Telephone & Telegraph Co. of Lancaster, Pa., affecting over 60 cities and towns, to be effective August 1.

SOUTH DAKOTA.

July 24: Order issued authorizing the Dell Rapids Telephone Co. to increase its rates for telephone service in Dell Rapids and Trent. No. 3510.

July 25: The commission granted permission to the St. Charles Telephone Co., of St. Charles, S. D., to increase its rate for business service from $1.75 to $2.50 per month and its rate for residence service from $1.25 to $1.75 per month. The company is ordered to execute written contracts with each and every company whose line or lines receive switching service from its exchange in St. Charles. It is also ordered to refund to its subscribers all No. 3572.

July 30: Order issued authorizing the Ethan Telephone Co. to increase its rental rates at Ethan, S. D., No. 3608.

July 30: The commission granted permission to the Delmont Telephone Co. of Delmont, S. D., to increase its rental rates. No. 3584.

VIRGINIA.

July 25: Petition filed by the Chesapeake & Potomac Telephone Co. for authority to place into effect a general increase in telephone rates in the various exchanges which it operates throughout the state.

WISCONSIN.

August 2: The commission granted increases in rates to the New Union Telephone Co. of Dodgeville, and the State Long Distance Telephone Co. of Elkhorn.

August 4: The commission issued an order to all telephone companies, effective August 1, when the companies went back to private control, restoring the rates in effect July 31, 1918, when the government took over the wires. No changes in the restored rate will be made by the commission unless application is made by the telephone companies in the usual manner.

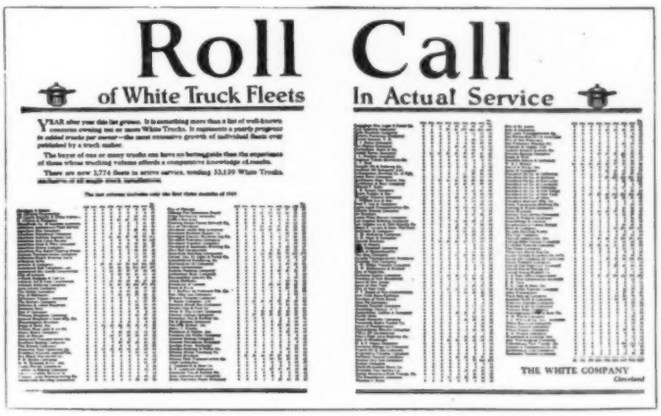
Statements of Importance to Truck Buyers

THE following group of statements made by The White Company in recent advertising summarizes the achievements of the White Product—the White fleet growth, mileage records, honors won in commerce and war; reviews the factors of strength and permanence back of every owner's investment in White Trucks.

All bear on one simple fact: the real value of a motor truck; its *ability to do the most work for the least money under all conditions.*

"Year after year this list grows. It is something more than a list of well-known concerns owning ten or more White Trucks. It represents *a yearly progress in added trucks per owner*—the most extensive growth of individual fleets ever published by a truck maker.

"There are now 2774 White Fleets in actual service, totaling 33,139 trucks, exclusive of all single truck installations."



"The ultimate mileage of White Trucks is still unmeasured. Some have rounded out 300,000 miles. Many have run 200,000 miles. Hundreds, probably thousands, have passed the 100,000 mark—a very common White performance."

"The purchaser of a White Truck backs his investment in it with the strength of The White Company, with its years of successful experience, with its thousands of trained employees, with its tens of thousands of trucks in active service, with its millions of capital and a service organization, nation-wide, which has no parallel in the industry."

The complete statements, in pamphlet form, will be sent upon request

THE WHITE COMPANY
CLEVELAND

Biographical and Personal Notes

H. C. Todd, vice-president and general manager of the Hanamo Telephone Co., of Maryville, Mo., is a pioneer in the Independent telephone field, having entered the business 23 years ago at the age of 16. While he was yet attending school he installed a 100-line switchboard, with 60 lines operating, for the Hanamo Telephone Co., at Maryville, on Saturdays and outside of his school hours.

H. C. Todd, of the Hanamo Telephone Co., Maryville, Mo., Is a Pioneer in the Independent Field.

Upon leaving school he went to work for the Independent company at Stanbery, Mo., as wire chief and trouble-shooter. After spending three months at Stanbery he went to Trenton, Mo., where he worked for the Bain brothers as lineman and trouble-shooter. From there he went to Burlington Junction, Mo., where he installed a plant of his own of 125 telephones. After operating this plant for a year and a half he sold it to the Hanamo Telephone Co., taking stock in the Hanamo company in exchange for his plant.

About 1900 he became wire chief for the Hanamo company, becoming vice-president and general manager of the properties eight years later. After some time, he and his father bought out all but one of the other stockholders and now they hold a controlling interest in the property.

Mr. Todd bought out the Bell in Maryville in 1913, merging the plant with the Hanamo system which now operates over 1,000 common battery telephones.

"H. C." was born in Donaldson, Iowa, on September 19, 1880, and received a grade and high school education. He has excellent mental capabilities and is naturally inclined to study. His is an analytical mind and while not as a general rule good on details, yet for certain things he is good on detail work. For instance, for years he has been the efficient sergeant-at-arms at the national convention at Chicago, as those attending can testify. Having good powers of concentration and being of a constructive nature, "H. C." is a good man for developing general ideas and plans, but rather modest in regard to his accomplishments.

Chas. R. Lowe has been appointed manager of the Williams County Telephone Co. of Bryan, Ohio, to succeed F. W. White, who resigned a short time ago. Mr. Lowe is at the present time auditor for Williams county, his term expiring the latter part of October.

E. H. Huffman, of New Franklin, Mo., is the new manager of the Boonville Telephone Co., Boonville, Mo. Mr. Huffman has been the manager of the New Franklin Telephone Co. for a number of years and will continue with the management of the company there as it has been consolidated with the Boonville system.

H. L. Gary, vice-president and treasurer of the Gary Properties, of Kansas City, Mo., has been appointed a member of the advisory board of the Million Population Club of Kansas City. The purpose of the club is to secure a million population for Kansas City by 1925 and its slogan is, "Sell your hammer and buy a horn." "H. L." was selected for this board on account of his standing in the community and because he is known to be a booster for Kansas City.

George K. Gann, traffic superintendent of the Lincoln Telephone & Telegraph Co. of Lincoln, Nebr., for the past 11 years, is a man of action. This love of action, together with his forcefulness, is put to good use in stirring up enthusiasm and interest among those associated with him in his work. When a new idea or plan which will improve traffic relations "sprouts" in "G. K.'s" fertile brain —as is not infrequently the case—he does not let go of it until he has put it into operation.

A Southerner by birth, "G. K." attended the public schools of Atlanta. Having an investigative mind, with a native ability for grasping facts and making his deductions and conclusions very quickly—necessary qualifications for a successful engineer —he entered the Georgia School of Technology immediately upon finishing high school.

Toward the close of his college course, he decided that the toll traffic department of the Southern Bell Telephone & Telegraph Co., in Atlanta, was a place where he could get some very valuable experience as a starter. Upon finishing his college work he secured a position with that company in its toll traffic department, where he spent several years, putting into practice some of his theories and getting some good practical experience.

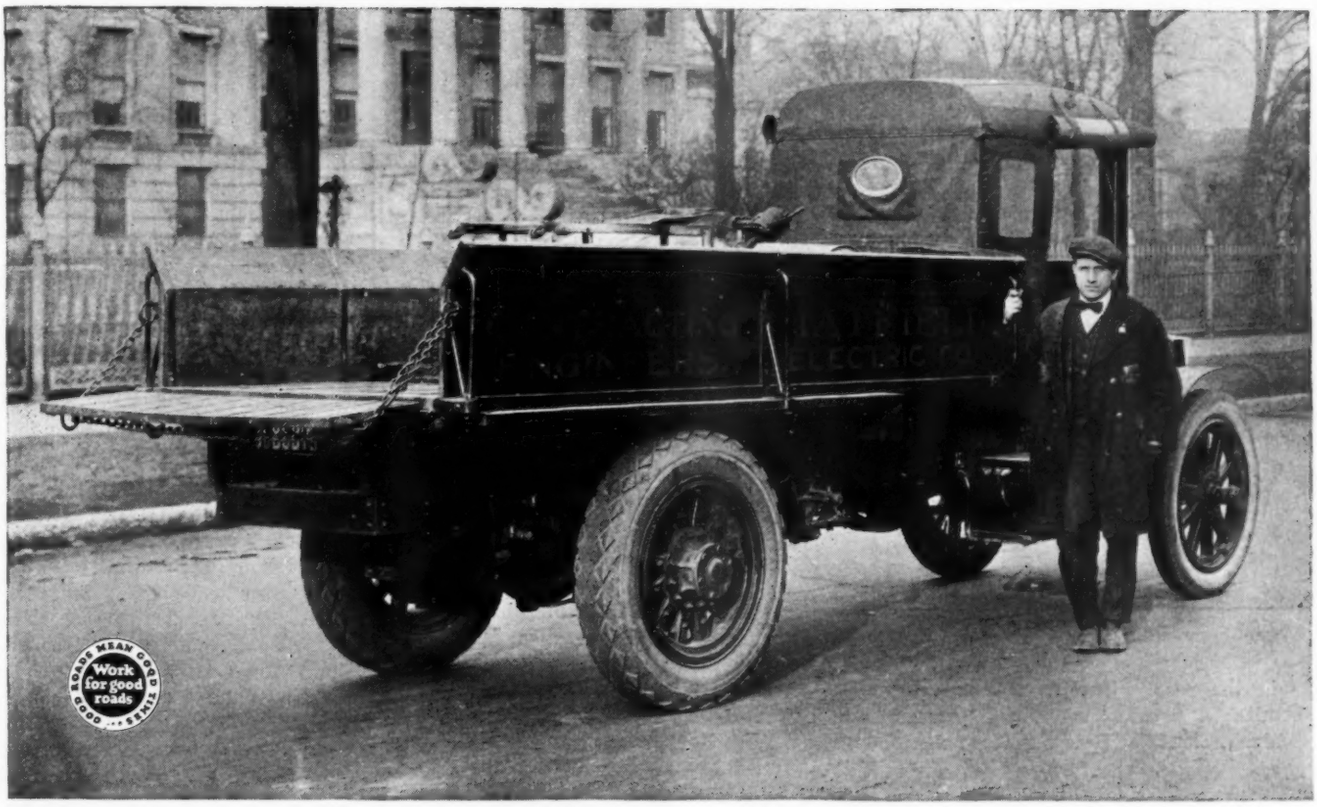
Since then he has specialized on toll traffic problems, where his ability to investigate and reason upon the facts uncovered has brought him to the front.

From Atlanta he went to St. Louis in 1906, in charge of the toll rate department for the Bell company, being promoted successively to toll line manager and assistant superintendent of traffic. In 1908 he was made traffic superintendent of the Lincoln company, in which capacity he has continued since that time.

Mr. Gann is a member of the traffic committee of the United States Independent Telephone Association and is well known among telephone traffic men all over the country through the various papers he has presented before national conventions on traffic matters. The correspondence school for toll operators, which he inaugurated several years ago, also has evoked considerable favorable comment among telephone men of other states.

Efficiency in his work is natural to "G. K." for he has real economic instincts and quickly sees the commercial possibilities of an idea or plan. However, he does not usually make public his ideas or plans until they are fully worked out and he is convinced of their feasibility and practicability. Yes, he is a good mixer—when he tries.

J. K. Gann, Traffic Superintendent of the Lincoln (Neb.) Company, Has Specialized on Toll Traffic Problems for Many Years.



Pneumatic Tires Practically Eliminate Truck Repairs

"Our Goodyear Pneumatic Cord Truck Tires have given 14,000 miles and look good for 4,000 more. The truck repair cost has amounted to only $8.00 so far. Yet this truck does one-third more work than a former truck which was equipped with solid tires. Goodyear Pneumatic Cord Truck Tires have practically eliminated repairs and depreciation and have added to the efficient operation of our trucks."
—Thomas F. Hatfield, Hatfield Electric Co.

TO truck owners perhaps the most important fact in the above letter is that the big Goodyear Pneumatics have reduced the truck repair costs to a remarkably low figure.

This achievement, which is usual with these tires, is due to the cushioning power, which so protects the engine and the mechanical parts of the truck from jars and jolts that the usual breakage is eliminated.

Then, because of the tractive power of these big Goodyear Cords, plus the advantages derived from the cushioning power, the Hatfield truck is enabled to do more work, and hence it earns more money for its owners.

Added to this value is the ability of these tires to resist road punishment and stay in service, and as evidence they have to date delivered 14,000 miles and look good for thousands more; 4,000 more in fact.

For many kinds of truck haulage these are the ideal tires, for they combine in one tire cushioning power, traction, greater activity and a tough endurance.

Then, in addition to this value, is the Goodyear Service that every Goodyear Truck Tire owner takes advantage of when he buys the tire and during the entire life of that tire.

This service not only helps in the accurate selection of the right size and type of tire but it also endeavors to serve the customer promptly and correctly during tire application; and finally this Goodyear Service helps to conserve the life of the tire so that truck owners may secure the very last mile of wear that is built into them.

For you to take full advantage of Goodyear Truck Tires and Service, it is only necessary for you to go or phone to the nearest Goodyear Truck Tire Service Station Dealer.

GOODYEAR
AKRON

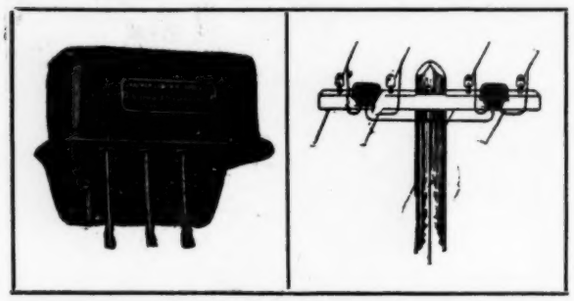
Please tell the Advertiser you saw his Advertisement in TELEPHONY.

From Factory and Salesroom

Conventions: Indiana, Indianapolis, Sept. 16-18; Missouri, Jefferson City, Sept. 16-17

Lightning Arrester for Installation on Telephone Poles.

It is during the summer months that the value of lightning arresters is impressed upon those responsible for the maintenance of telephone service, especially in the rural districts. During these months, thunderstorms or, correctly speaking, electrical storms are most frequent.



The Chapman Lightning Arrester. Arrester Installed on Cross Arm.

Telephone lines furnish excellent media for the conduct of lightning discharges to the ground. In thus seeking the ground the discharges pass frequently through telephone instruments located in farm houses and other residences, often causing much serious damage if they are unprotected.

One of the methods for preventing damages from lightning to telephone instruments and residences is the installation of arresters on the poles. The accompanying illustration shows a type of arresters used for this purpose. The Chapman lightning arrester, which is the one shown, is an air-gap carbon plate arrester. The carbon ground plate, 4½ins. by 1½ ins. by ¼ in. is rigidly held just the right distance away from the line discharge terminal.

The line carbons are circular in shape. The discharge surface of each terminal has an area of 1½ square inches distributed over 42 pyramid discharge points arranged in vertical rows with channels between them, down which the disrupted carbon particles have a clear passageway to the bottom of the case.

The carbons are all mounted on a one-piece porcelain mounting with conductor outlets through the base arranged so that the insulation resistance of the line is not affected under the most severe weather conditions. There is a weatherproof casing of No. 44 gage steel, Sherardized as a rust preventive. The joint between the base and top is sealed with a rubber gasket, making it water, dust and bug-proof.

As shown in the illustration, it is designed for mounting on cross arms. Ribs in the back of the base not only strengthen it but also hold the arrester from the cross arm so that water can not lodge behind it and rot the arm.

Each arrester is fitted with connecting wires 24 ins. long, thus simplifying the installation of the arrester. Not only does this arrester act efficiently in conducting lightning discharges to ground but it keeps the line maintained at practically normal potential under various atmospheric conditions for accumulated static charges are also discharged across the air gap to the ground carbon.

The Minnesota Electric Co., of Minneapolis, Minn., is the manufacturer of the Chapman arrester and will be glad to supply full information regarding it, to those interested upon application.

Pratt Ledger a Time-Saver in Telephone Accounting.

Telephone companies, in the sparsely-settled rural communities as well as the larger cities, are coming to realize that in the presentation of an application for increased rates before their respective state public utilities commissions there is no more valuable an asset than a well-kept set of books which show the company's true financial condition.

Very often the duties of the manager in the small exchange include the keeping of the accounts, in addition to shooting trouble and directing the affairs of the company in general. Naturally he is, or should be, interested in any method or device which will improve the efficiency of his accounting system and reduce the work to a minimum.

The tab-cut self-indexing ledger designed and manufactured by the Pratt Audit Co., of Chicago, should prove a great time-saver to the telephone exchange manager. With this ledger postings may be made quickly and accounts kept balanced correctly all the time. In place of the usual index of the old style ledger, the account names are written on the tab-cut ledger leaves, and it is possible to turn to any account that may be wanted immediately.

Only two finger movements are needed to open the ledger account to the exact page, in comparison to six to ten movements usually taken in finding the account desired.

The ledger pages are 11¼ by 11⅞ inches and contain 25 accounts under each division. The brown lines, easy on the eyes, are a distinctive feature which appeals to workers whose eyes are taxed to the utmost. The pages show debit, credit and balance columns, making it possible to see the condition of the ledger account after every posting if the bookkeeper will draw the balance or the balance may be shown once a month as desired.

Sales Representative Leaves Field After Long Service.

After 23 years' connection with the operating and sales ends of the Independent telephone business, E. P. Schafer severed his connections with the Stromberg-Carlson Telephone Mfg. Co. as sales representative with headquarters in Indianapolis, Ind., the latter part of June, to accept the secretaryship of the Nebraska Fertilizer Co. of Omaha, Neb.

Mr. Schafer entered the telephone field 23 years ago as manager of the Three Rivers (Mich.) Telephone Co., when telephones and switchboards were very crude affairs.

He resigned from that position some seven years later (February, 1903), to accept his recent position as salesman in Indiana territory for the Stromberg-Carlson Telephone Mfg. Co. He also handled Southern Michigan in connection with his Indiana territory for five years.

E. P. Schafer, for Years Stromberg Sales Representative, Has Left the Telephone Field.

Mr. Schafer says he will miss the daily handshakes of "Henry, Frank, Harry and George," and we venture to assert that they will miss his. However, they all wish him success in his new connections.